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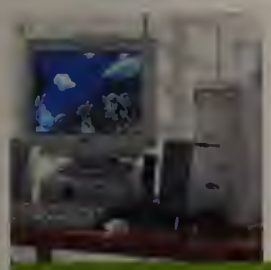
DECEMBER 1998



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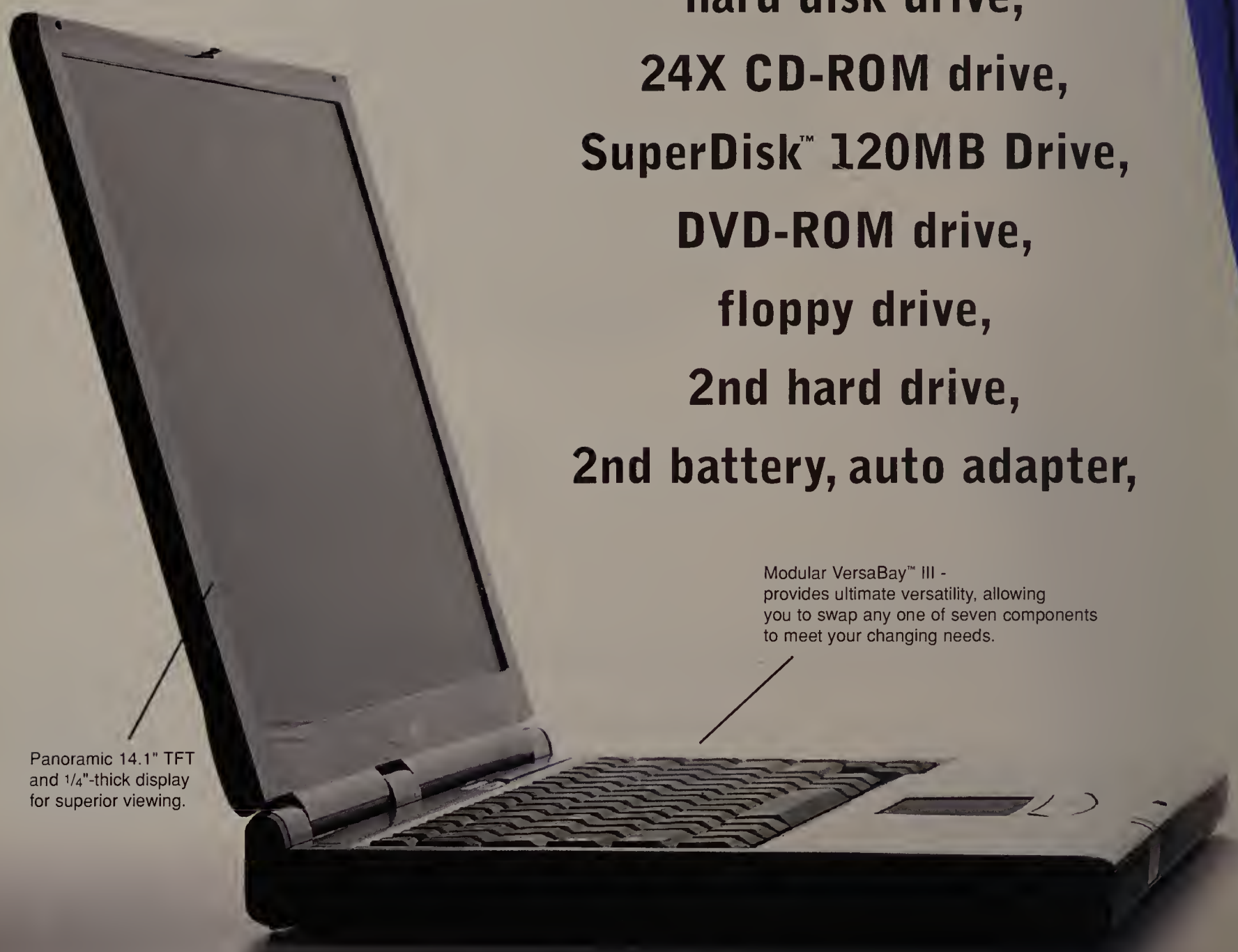

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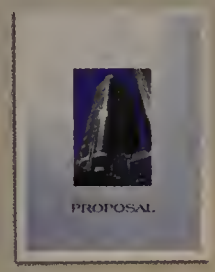

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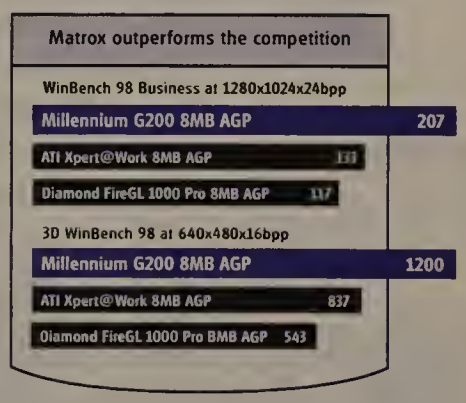

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PC WORLD

DECEMBER

VOLUME 16 ◆ NUMBER 12

COVER STORY

118 **THE SEVEN SMARTEST PC UPGRADES FOR UNDER $200**

SYSTEMS With new PCs tagged at less than $1000, it's not always wise to upgrade last year's model. To help you make the right choice, we examined some great (and some not-so-great) desktop upgrade options—from adding RAM to popping in a DVD-ROM drive, from replacing your CPU to swapping out your current hard drive—so you'll know when to ante up and when to stand pat.

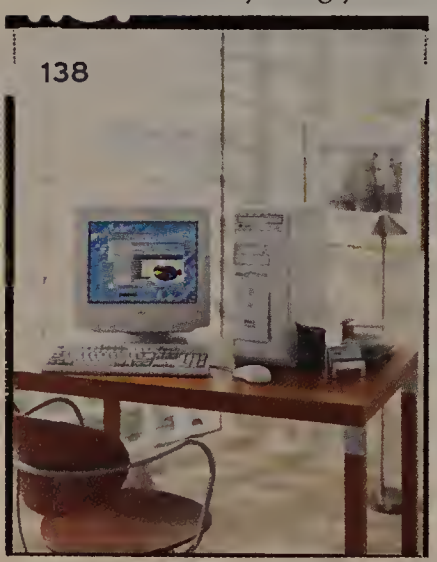
FEATURES

138 **HOME PCs FOR THE HOLIDAYS**

REVIEW Individual home systems differ as much from one another as the small businesses, families, and hard-core gamers who use them. We put 13 best-of-breed computers through their paces; in our winner's circle, you'll find dream machines to suit every taste.

160 **ALL COLOR, ALL THE TIME**

REVIEW Why settle for black and white now that color printers give you everything you want? New ink jets produce great-looking output, while lightning-fast color lasers cost little more than top-of-the-line PCs. For home, small-business, and corporate users alike, that means dazzling, affordable color printing. We tested 16 models and tab 3 as the best and the brightest.



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CONSUMER ALERT Counterfeit and pirated software is available everywhere—at swap meets, from online auctions, even installed on new PCs. If any of this software is lurking on your hard disk, not only are you breaking the law, but you can forget about support and updates.

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SMALL OFFICE/HOME OFFICE

185 **THE BEST OFFICE FOR YOUR BUDGET**

As your small office takes off, your equipment needs change along with your budget. Which PCs and printers should you consider? How about a fax machine? Maybe a network? Here's what you need and when you need it as your enterprise grows from a solo shop to a multiperson juggernaut.

Additional material available on PC World Online: www.pcworld.com

COVER *Photography by Marc Simon*

ICONS: JEFFREY PELO

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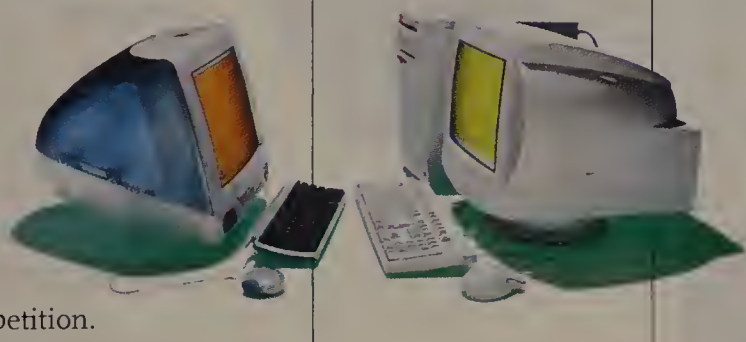

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NEWS PC World Today revisits November's "AMD Inside Your Notebook: Wait for Round Two," and takes an in-depth look at the price and performance of notebook computers that are based on the company's K6-2 processor.
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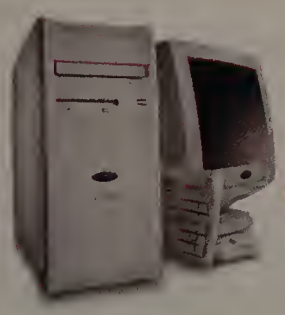

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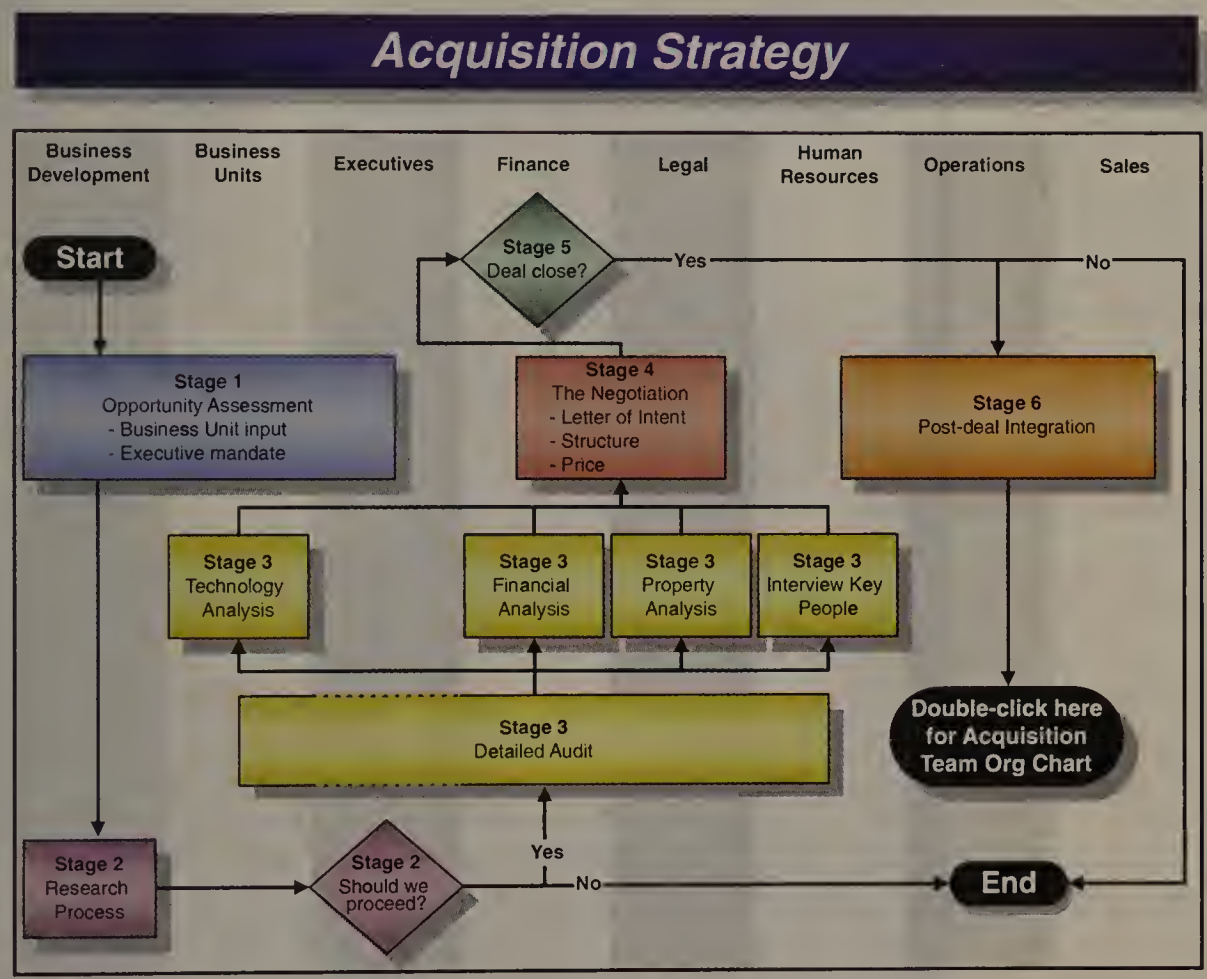

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The Site You Save May Be Your Own

WE ALL FEEL DULY OUTRAGED at the theft of a Rembrandt. But when someone makes a million counterfeit Beanie Babies, we shrug or wonder whether we'll be able to get one cheap. Perhaps mundane things like Beanie Babies seem unworthy of a grand name like "intellectual property." And if they're not worthy of that name, how can they be protected by intellectual property rights?

Software programmers like to think of themselves as intellectual giants. All the evidence, however, suggests that the general public ranks their product nearer the Beanie Baby than the Rembrandt. Few of us are outraged by illegal copying of software, and fewer still by illicit selling of software on the gray market. Christina Wood's article "Is Your Software Stolen?" (page 177) on pirated and counterfeit programs may heighten sensitivity to this issue, especially by examining the link between the gray market and organized crime. One expert even claims that terrorists are funding their activities through the sale of counterfeit software.

In the age of the Web, the intellectual property that should worry you the most is your own.

But in the age of the Web, the intellectual property that should worry you the most is your own. Sooner or later, you'll probably launch your own business-related Web site. Perhaps you've already done so. The danger? Some unscrupulous counterfeiter could copy your site's design or even use a "site-ripping" program to download all the content and launch a low-cost clone.

And if you think no one would be so brazen as to make a copy of the business that is your creation and the source of your income and pride, think again. Consider an example.

DESIGN PIRATES

SUPPOSE YOUR BUSINESS is a Web publication. Prior to launching your online magazine, you come up with a distinctive design for the home page. For the sake of simplicity, let's suppose your design has the same elements as the cover of the print version of *PC World*. You decide to make the name of your Web publication stand out by rendering it in white letters within a solid red bar, like the logo of this magazine. You choose to highlight some of the stories with a horizontal series of pictures and accompanying text, extending all the way across the page—again like the ones that appear just beneath the logo on *PC World*. You settle on the specific arrangement of the pictures and text in the horizontal series. You determine that each picture should be placed to the left of its text. You conclude that the text should consist of a headline in larger type and a description of the story in smaller type. You call each picture-text combination a "skybox."

Suppose you also decide to use, along with the white logo reversed out of a red bar and the row of skyboxes, a corner banner at the upper right of the home-page screen—a diagonal stripe across the corner of the page containing additional type. You consider these three elements together—the white logo reversed out of a red background, the row of skyboxes under the logo, and the corner banner at the upper right—your distinctive creation. And though by no means a Rembrandt, this combination sets the identity of your Web publication apart from all its competitors. What's more, your new home-page treatment is a great success for the next 20 months, helping make you the most popular Web site in your category.

SHOCKED, APPALLED, RIPPED OFF

THEN ONE FINE DAY, a competing publication with a name similar to yours, covering a topic like yours, suddenly shows up on the Web with a look that resembles yours to a remarkable degree. Suppose the competitor goes so far as to use a white logo reversed out of a red bar, like yours, and a row of skyboxes underneath the logo, like yours, and a corner banner at the upper right, like yours. Imagine how you would feel. Shocked—because no self-respecting editor, designer, or publisher would stoop to copying the distinctive look of a competing publication. Appalled—because it's hard to imagine any purpose for the imitation other than to dupe people into mistaking the imitation for the original. Ripped off—because your home-page design is being used not only without your permission, but against your interests!

Theft of this sort is precisely the type of crime that intellectual property rights are designed to prevent. Infringement is particularly easy in the online world, where anyone with a few simple tools and an ISP account can be a publisher—or a thief. Keep that in mind if you ever feel tempted to take advantage of too-good-to-be-true bargains on software or Beanie Babies. Whether what's at stake is fine art, a fortune, or credit for your own creations, intellectual property rights are worth fighting for.

Phil Lemmons is editorial director of PC World. ■

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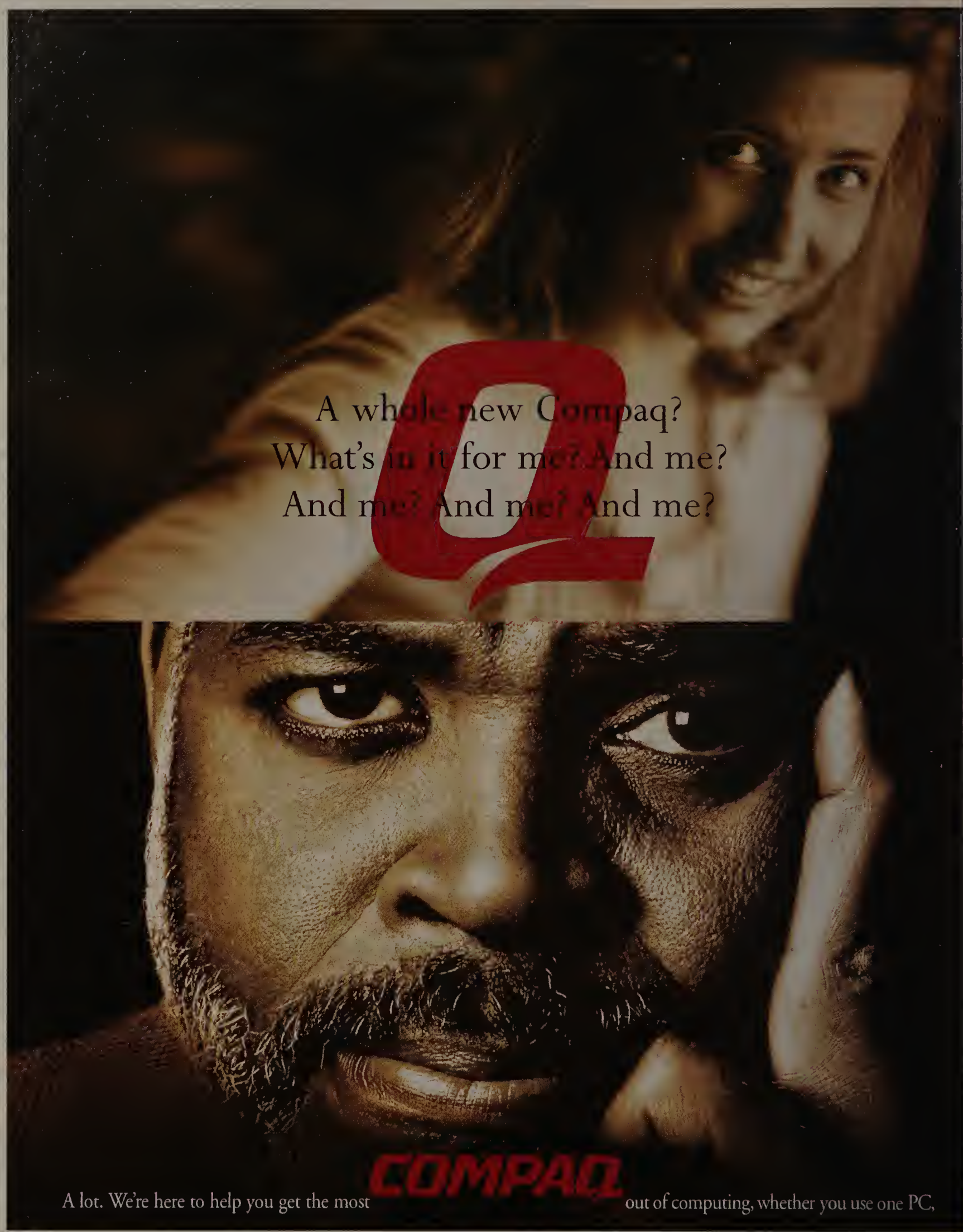

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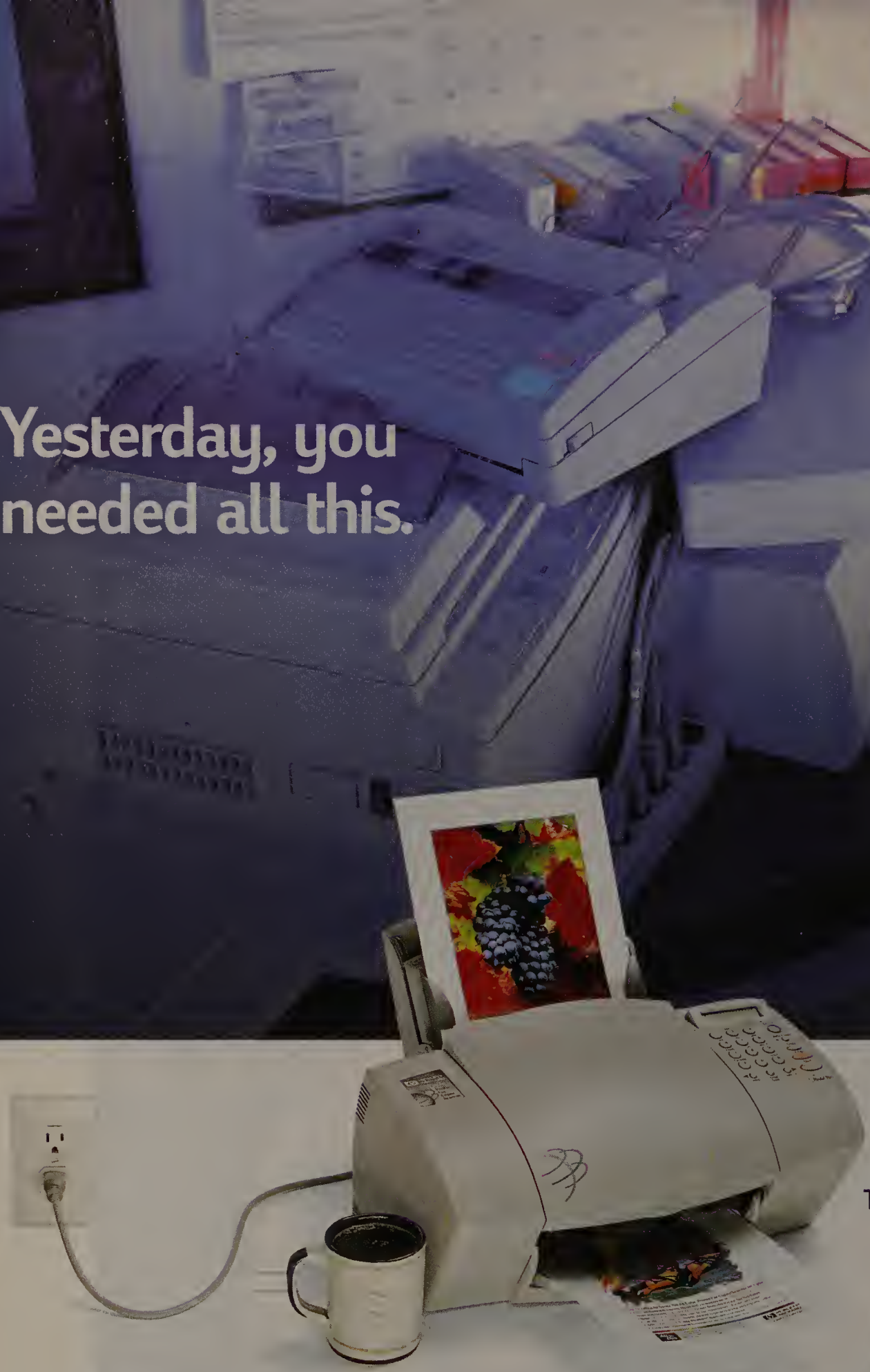

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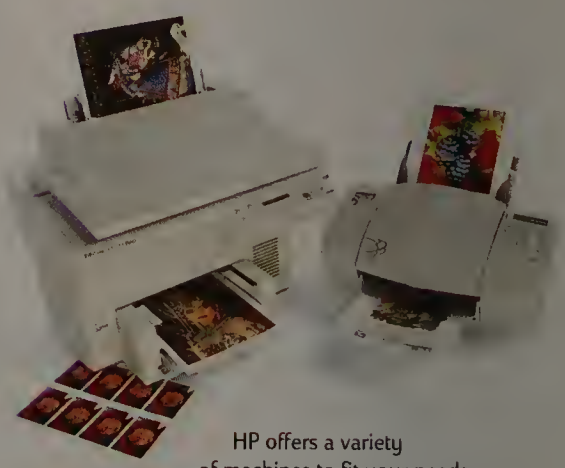

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YOUR TAKE ON: Windows 98 ◆ Internet privacy ◆ Antispam tactics

WINDOWS 98

YOUR ARTICLE "Bugged by Windows 98? Glitches Are Driving Users up the Wall" [*Top of the News*, October, page 64] brought back many of the nightmares caused by my upgrade.

I'm uninstalling Windows 98 for good and going back to Windows 95. To anyone thinking of upgrading, I would say that if Windows 95 doesn't give you any major problems, then stick with it; don't upgrade just for the sake of staying current. I did that, and it just isn't worth the aggravation and time required to get Windows 98 working properly.

Gary Augustyniak
Hamilton, Ontario

IF YOU THINK upgrading to Windows 98 will solve your screen freezes, invalid page faults, and other recurring mysterious activities by your computer, think again! I recently upgraded to Win 98. I naively thought doing so would solve some or all of the problems that occurred under Windows 95. Instead, it created several more. I still experience lockup, screen freezes, page faults, and general protection errors daily. Upgrading to Windows 98 only upgraded my list of problems. Other than as "eye candy," Windows 98 is no better for the home PC user than Windows 95. Save your money! Don't bother upgrading to Windows 98. It doesn't work either.

Randy Hargus
Manassas, Virginia

PRIVACY, CONTINUED

AFTER READING YOUR September issue on Internet privacy, a friend of mine decided to see how secure his e-mail passwords really were. He called his ISP, told the rep that he'd had a total system crash, and asked for his passwords. The rep obliged readily, asking only my friend's user name (not even his account password!) for identification. The best security measures do no good if your ISP gives out your passwords over the phone.

Bill Ferrioli
Harrisonburg, Virginia

FOR PC SECURITY, DON'T USE WINDOWS

YOUR SPECIAL ISSUE on "Privacy in the Internet Age" offers work-arounds for much of the inherent insecurity of Windows but fails to attack the issue head-on.

Systems that contain truly valuable information should certainly not run ▶

HOT BUTTON

Where's the Check? 'Rebate or Rip-Off?' Has Readers Roused

THANKS TO Roberta Furger for "Rebate or Rip-Off?" [October]. I was relieved to know I'm not alone in having to fight for my rebates, and shocked to learn so many companies get away with misleading consumers and reneging on their promises. I have been waiting since November 1997 for $40 in rebates from a company that has the nerve to repeatedly tell me "the check is in the mail."

Keep up the good work, and continue to expose those who take advantage of consumers. If it weren't for us, they'd be out of business.

Bradley S. Galliers, Perrysburg, Ohio

CONSUMERS, YOU have the right to complain. If you get nowhere with negligent vendors, call your credit card company and stop payment to the vendor. This is what I've done in one case, and that dispute is now under review. Even if I don't win, I won't go down without a fight. It's my money, after all—money the vendor got only because of a promise it hasn't kept (yet). You may think, "I'm just a little consumer; my few shopping dollars don't really matter." But those dollars do add up, and they do matter.

Jason Zandri
Wallingford, Connecticut

I AM WAITING for two $30 rebate checks. I've made several calls to the company (long distance). Most of the time I was put on hold so long that I hung up. I got a voice mailbox once and left a message, but my call was never returned. An e-mail to the rebate department went unanswered as well.

I think there should be tougher legislation on this issue. These firms cannot be allowed to use rebates as bait if they're not going to stand behind their offers.

Julie Dunlap, Athol, Massachusetts

NO ONE GOES into business to fail, and rebates are attempts to increase business. Therefore, the companies providing them should *expect* an increase in sales. When these companies then tell customers, "We were overwhelmed with the response" or "We never expected such an increase," one has to wonder: Are they just throwing consumers a baited line?

I now wait until the price *without* the rebate drops to my target. That way, I avoid the frustration of trying to track down *my* money. There are a few fish more wary of biting now.

Michael E. Barr, Las Vegas

I TRY TO AVOID rebate offers, but if I can't, I assume the worst at the outset and grimly vow to retrieve even the smallest amount so as to discourage this fraudulent practice. I've set up a spreadsheet on my computer called "rebates receivable." Every 30 days after the due date, I send a dunning notice to the deadbeats, and after 90 days I report them to the Better Business Bureau. I've had to alert the BBB only twice, and that was all it took to get my money. But I was almost disappointed when I finally got the piddling checks in the mail and had to halt my vendetta.

Geoffrey Newcomb
Walnut Creek, California

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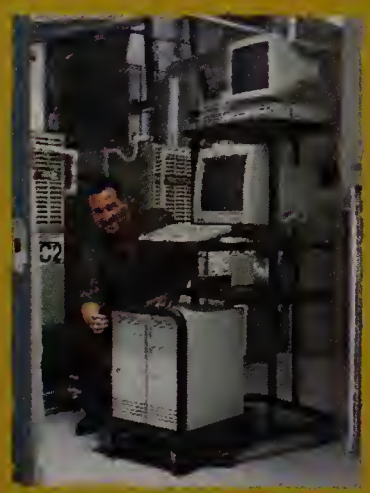

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Windows 95 or 98. Win NT is significantly better but is no match for a well-run UNIX platform, particularly OpenBSD. A properly run HPUX, Solaris, or Linux box is also far more secure than NT.

The bottom line is that those concerned about their privacy should ask a consultant about operating systems designed for security, instead of tweaking the basically insecure systems in common use today.

Charles Duffy
Chico, California

KEEP KEYBOARD WATER-FREE

IN "THE TROUBLE-FREE PC" [October], one tip—"Are You the Clean Type?" page 106—suggests as a last resort immersing your keyboard in water to clean it. Don't do this. Use alcohol instead. Immersion will take a few bottles and should be done in a well-ventilated room (alcohol fumes are flammable), but the result will be much better. Alcohol evaporates quickly, leaves no residue, and won't rust metal parts.

David Charlap, Arlington, Virginia

AOL–YOU CAN TAKE IT WITH YOU

YOUR RECENT ARTICLE on America Online ["AOL 4.0: An Old Online Service Learns New Tricks," *Top of the News*, September, page 72] fails to mention a big reason for AOL's popularity: portability.

I often use a local Internet service provider to bypass the AOL interface or to get online when my wife is on AOL. But I travel all over the country, and 90 percent of the time AOL is a local call—which means I can keep up with e-mail, investments, news, and so forth. Even if there is no local number, the 800 number works (I keep such sessions short, but at $6 per hour it's not painful).

Wayne Howard
Warner Robins, Georgia

MAIL BOMBS AND SPAM

IN THE ARTICLE "Get This #$?* Spam Outta Here!" [*Consumer Watch*, September] Roberta Furger refers to a group of Netizens who, among other things, have "lobbed mail bombs—e-mail messages that overwhelm a junk mailer's in-box."

I'm an Internet activist and can say with certainty that, with a few exceptions, ▶

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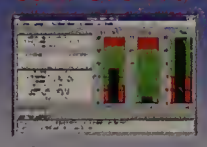

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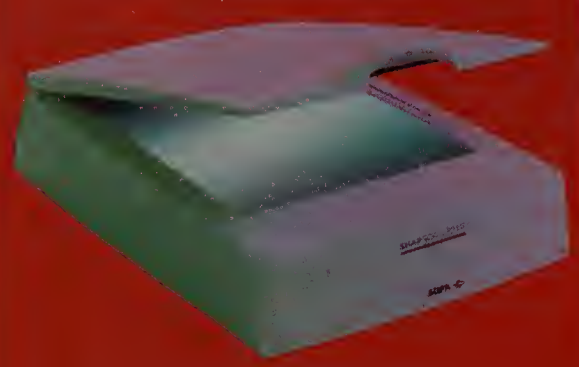

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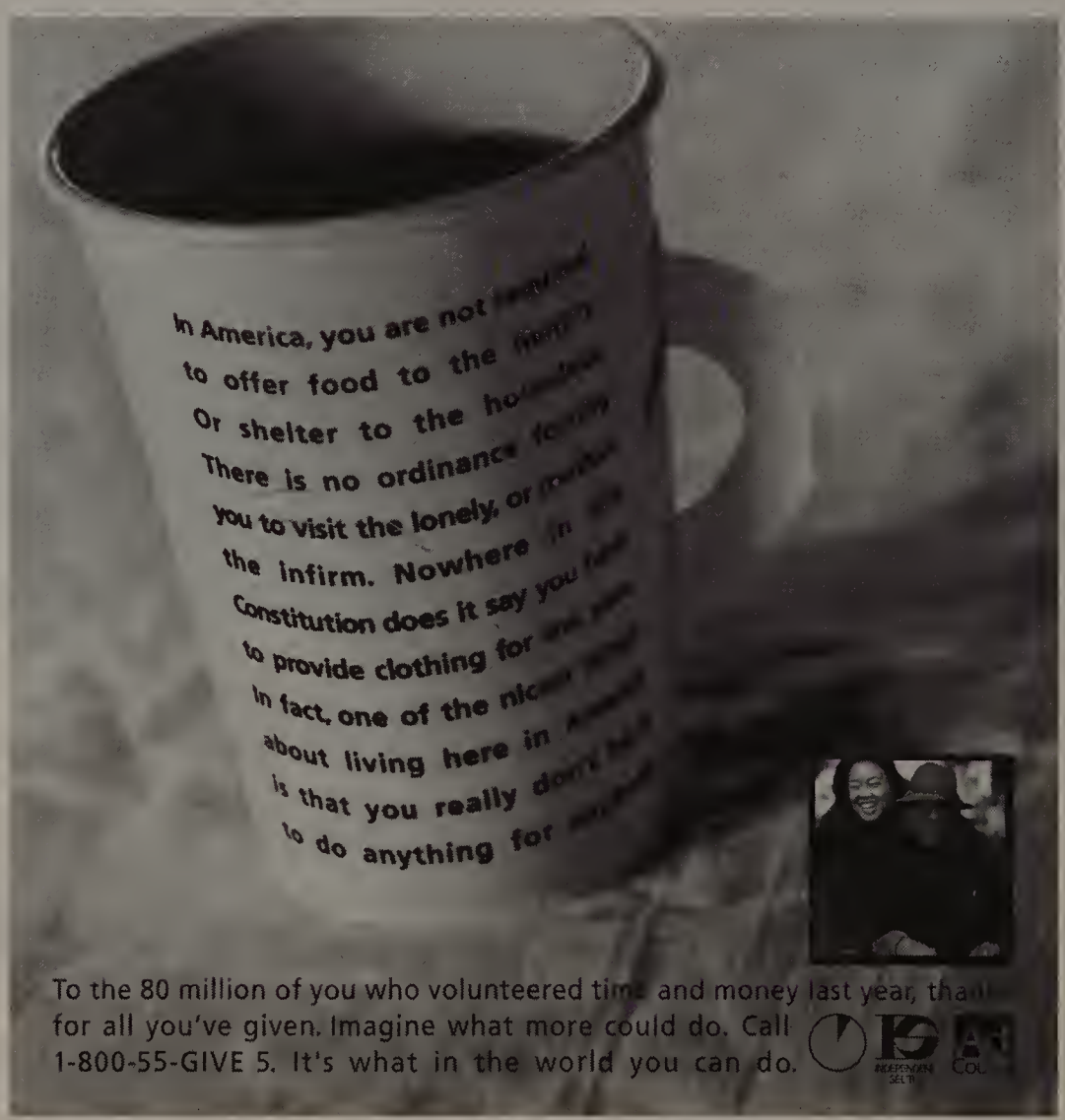

antispammers greatly disapprove of such drastic actions. Most antispammers are opposed not to e-mail marketing, but to unsolicited bulk e-mail.

The article fails to mention the primary antispam tactics, including reporting spammers to their dial-up and Web site providers, cooperating with these providers to help evict spammers, blocking Internet traffic from providers who willingly harbor spammers, and boycotting companies that spam.

Most of the action against spammers is taken by their service providers in reaction to spammers' violations of providers' acceptable-use policies, usually on a tip from one or more spamfighters.

Jeff Gehlbach
Huntsville, Alabama

PC World *welcomes your responses, ideas, and other letters to the editor. See page 14 for contact information.* ■

CORRECTIONS AND CLARIFICATIONS

NOVEMBER'S *Top 10 Home PCs* should have stated that the $1999 Gateway G6-400h includes 64MB of SDRAM, a 10GB hard disk, and a 17-inch monitor.

In "Notebooks for the Long Haul" (November) we printed a battery life score of 50 minutes for a preproduction unit of the Panasonic ToughBook 71. That should have been a production unit's score of 2 hours and 20 minutes.

In October's "Where the Buys Are," the chart "Catalog Shopping: What's It Going to Cost You?" (page 170) contained totals for Egghead.com, Insight, NECX, CompUSA Direct, and MicroWarehouse that did not include shipping and handling costs.

October's *Top 20 Budget Desktops* stated that IDot.com sells its systems only over the Web; in fact, it also sells over the phone, at 888/388-4368.

October's *New Products* review of uninterruptible power supplies may have implied that Guardian on Board's PowerCard requires more IRQ resources than other UPS devices, but all current UPS products with auto-shutdown capabilities use a COM port, which requires one IRQ.

PC World regrets the errors.

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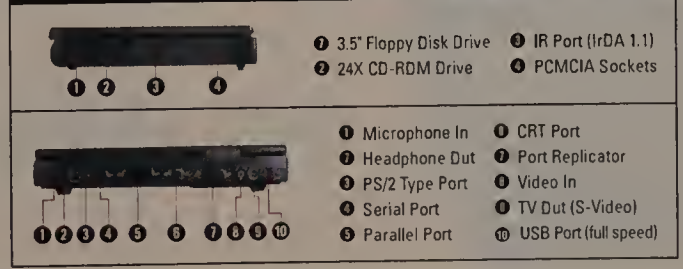

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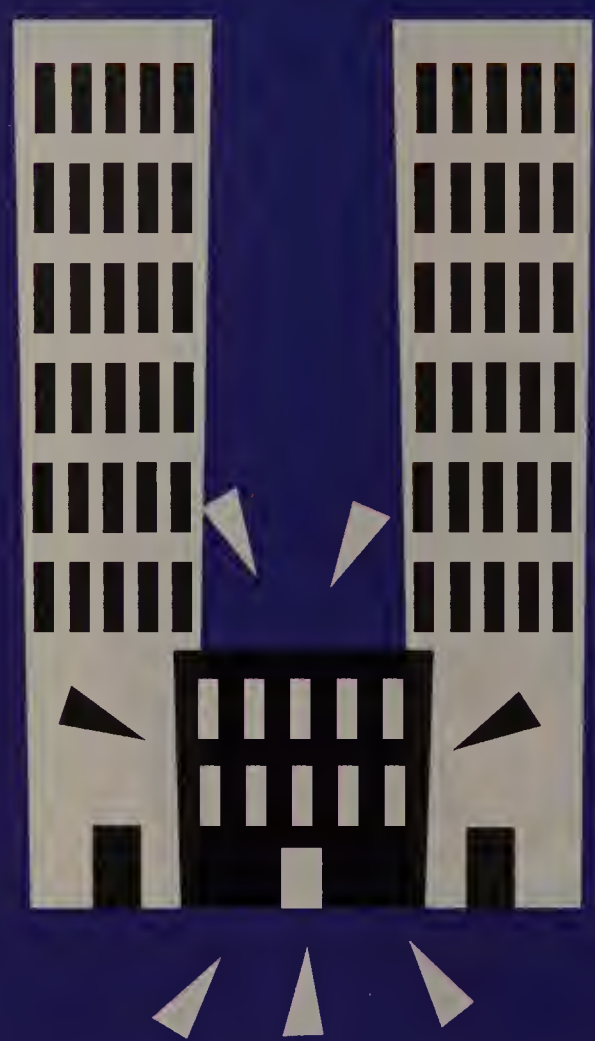

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Saints and Sinners: 1998 in Review

Some companies do it right. Some do it wrong. None of their actions go unnoticed.

HOW DOES A PC VENDOR earn your loyalty? Competitive prices are obviously a plus, but price alone won't make you a long-time customer. Service is what counts. (I don't know about you, but I don't think I've ever bought a software program or a critical piece of hardware solely because of its price.)

Great service can take many forms. It can be a demonstrated commitment to providing high-quality technical support and repair services. It can mean testing software fully to ensure that the final released product is bug-free (or as close to that ideal as possible). It can mean introducing innovative new services that offer customers greater choice. These types of customer-first policies and practices are what earn companies sainthood in this annual look at the year in review.

And the sinners? These are the companies whose buggy products or poor service—or combination of both—have left customers in the lurch, companies whose practices (if not policies) leave customers feeling frustrated, ignored, and angry.

You may notice that this year's listing of saints includes several organizations outside the computer industry. As we move ever further into the brave new world of Web-based computing, these watchdog groups play an invaluable role in ensuring that the needs and rights of consumers remain paramount. Their efforts deserve our thanks and support.

Microsoft. Many at Microsoft will forever remember 1998 as the year Bill Gates went head-to-head with Attorney General Janet Reno. But many computer users will remember it as the year Microsoft released a steady stream of buggy products and tried to tame glitches in previous releases. First there was Internet Explorer 4.0, with its much-publicized security holes that allowed Web hackers to view data on individual hard drives. Then came a procession of often small but annoying bugs. And instead of a straightforward patch, Microsoft issued the Internet Explorer Service Pack 1—then left it up to customers to figure out if they needed to install it. Thanks for the help.

Windows 98 wasn't without problems, either. The biggest headaches for consumers concerned incompatibilities between existing hardware and software and the upgraded OS. Just about all the leading notebook manufacturers reported incompatibilities with Win 98. And glitches with Office 97 compelled Microsoft to issue not one, but two service releases. Unfortunately, the releases weren't cumulative, so users had to install *both* updates to take advantage of all the fixes and work-arounds.

Netscape Communications. Netscape earned sainthood last year for holding its own in the browser war against Microsoft. One year later, the company—and its award-winning browser—are still going strong, keeping significant market share while continuing to offer enhancements to customers. Netscape is also commended for embracing ▶

ILLUSTRATIONS: MARK MATCHO

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the open source code model with Navigator 5.0—a move that lets all developers improve and debug Navigator. Even if opening the code was just a strategy to survive Microsoft's aggressive marketing, the result is great news for users.

Iomega. First Iomega dug itself out from under a class action suit (and bad consumer feelings) related to customer service and support. Customers complained of being put on hold for long periods of time and later being charged excessive amounts for those calls. Then the company found itself in the midst of a brand-new controversy, the so-called Click of Death. Iomega acknowledged last February that the clicking sound in a small number of Zip drives could signify that some or all Zip disks are unreadable—bad news for folks who'd used them to store valuable data. Iomega initially refused to replace faulty drives that were more than one year old, but it has now dropped that time limit.

Dell, Gateway, and Micron. Thousands of motorists choose to lease a vehicle rather than buy a new car every few years. Now, thanks to two of these leading computer makers—Dell and Micron—consumers can lease their next PC. These lease programs aren't the cheapest way to move up to state-of-the-art, but for the cash-strapped, credit-card poor among us, they offer a hedge against the never-ending battle to stay current with the latest technology.

Gateway, too, deserves praise for its innovative YourWare program, which, like the lease options from Dell and Micron, lets customers pay for their computer in low monthly installments. Another advantage of YourWare: After two years consumers can trade the computer in (at fair market value) for a new model.

Maximus Computers. This Southern California company presents so many reasons to be included in the sinners category, it's hard to know where to begin. First, there were charges early in the year that customers had received unlicensed software with their Maximus computers. (See last February's *PCW Advocate;* Maximus officials said at that time that the installation of unlicensed software was "a mistake.") Then came a stream of complaints about obtaining service and support from the mail-order company. At this writing, Maximus is under investigation by the Florida attorney general's office for not providing either the on-site service or the 24-hour technical support that it had promised customers.

Better Business Bureau. Thanks to BBBOnLine, consumers can shop on the Web with confidence, knowing that any merchant whose site bears the familiar BBB logo has passed a thorough inspection by this well-known and trusted organization. To earn the BBBOnLine seal of approval, a company must meet a number of requirements, including participating in an arbitration program to resolve customer complaints. Unfortunately for consumers, relatively few companies (only 1750 to date) are taking advantage of this service.

The E-Commerce industry. With a few notable exceptions, Web merchants have ignored calls for self-restraint in their rampant collecting of personal information online. According to a June 1998 report by the Federal Trade Commission, 92 percent of all commercial Web sites collect personal information about consumers, while only 14 percent offer any type of notice about their data collection practices—including a straightforward, easily located privacy policy. Faced with federal controls, the e-commerce industry is arguing that self-regulation, not legislation, is the best way to protect consumer privacy. Sorry folks: It's too little, too late.

Federal Trade Commission. The FTC earns major kudos for speaking out for consumers on two critical online issues: the proliferation of junk e-mail, and the furtive collection of personal information by Web sites of every type. Besides convening an ad hoc group to investigate solutions to the spam scourge, the FTC conducted a comprehensive survey of Web sites last spring, and subsequently called for federal legislation to govern the collection of information from children online. Now, if only Congress would do its part. ▶

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Center for Media Education. CME has provided a constant voice of reason in the ongoing battle to protect the privacy of online consumers. This Washington, D.C., watchdog group was at the vanguard when it sounded the alarm about online marketing and advertising aimed at children with the release of its groundbreaking 1996 report, *Web of Deception*. The organization continues to advocate tirelessly for children's rights, educating the public on this critical issue and pushing Congress to adopt legislation governing the collection of data from children who are online.

Detwiler Foundation's Computers for Schools Program. Since its founding in 1991, this San Diego–based organization has placed more than 40,000 computers in public and private schools. With the help of some key private-sector grants and through an innovative cooperative effort with the Federal Bureau of Prisons (whose inmates upgrade and repair donated computers), the foundation has expanded its efforts to more than a dozen states. Many more states are scheduled to sign on in the coming year.

The PC industry. Despite all the predictions of data loss and other dire consequences, software (and hardware) companies have failed to devise industrywide standards for handling the year 2000 problem (when computers may misread dates). Instead, consumers and businesses alike will have to deal with a multitude of different fixes, even among different versions of the same application.

For example, the fix in Microsoft Excel 7 does not match the remedy in Excel 97, raising the potential for untold headaches and data corruption for users who need to work with a file in both versions of Excel. Where does this lack of Y2K conformity leave consumers? In the lurch.

Encountered any sinners lately? Or saints? Send your nominations to consumerwatch@pcworld.com. Roberta Furger is a PC World *contributing editor and author of* Does Jane Compute? Preserving Our Daughters' Place in the Cyber Revolution *(Warner Books, 1998).* ■

COMING UP
IN JANUARY

BUGGY SOFTWARE

Which programs are the buggiest? Which companies fix bugs best? *PC World's* survey of users and vendors provides some unexpected answers.

YOUR PC AND THE YEAR 2000

Think your PC and data won't be affected by the millennium? Not so fast. Here's how software testing, Web surfing, and a close look at your data can prepare you for the new century.

MAKING V.90 MODEMS WORK

Our review of 15 of the latest V.90 modems proved trickier than usual. The wild card factor: matching your V.90 modem to your ISP's could make the difference in performance.

DO DIGITAL CAMERAS CLICK?

The latest digital cameras go way beyond simple point-and-shoot functions. But will your business or hobby really benefit from a pricey megapixel model? We review 11 snazzy new cameras priced at less than $1000.

ALSO NEXT MONTH

▶**The PC World Top 100:** Top 20 Power Desktops, Top 20 Budget Desktops, Notebooks, and Home PCs, plus our Top 10 Printers, Monitors, Graphics Boards, and Modems.

▶**Web Services for Your Business:** Does your business need a simple "billboard" page or a full-service site with order forms and credit card transactions? Here's how to know and where to go.

▶**Here's How:** Windows Tips on the best way to use Disk Cleanup, Internet Tips on finding files you want on Microsoft.com, and Upgrade Guide on installing a new CD-RW drive.

PC WORLD

HAVE WE GOT YOUR ATTENTION YET?

VisionMaster 450
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PC WORLD 1998 WORLD CLASS
1998 Vision Master 450

PC MAGAZINE EDITORS' CHOICE
October 6, 1998
VisionMaster 450

PC Computing
May 1998 VisionMaster 450

CADALYST LABS HIGHLY RECOMMENDED 1998
Perfect Five-Star Rating
January 1998
VisionMaster 450

PC WORLD BEST BUY
April 1998 VisionMaster 450

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	VisionMaster Pro 501 (19.5" VIS)	TCO '95	0.28mm/AG	96khz	1600 x 1200@75hz	$939
	VisionMaster 502 (19.5" VIS)	TCO '95	0.27mm/dp	110khz	1800 x 1440@74hz	$999
	VisionMaster 501 (19.5" VIS)	TCO '95	0.27mm/dp	96khz	1600 x 1200@75hz	$939
19"	**VisionMaster Pro 450** (18.0" VIS)	TCO '95	0.25mm/AG	102khz	1600 x 1200@80hz	$699
	VisionMaster 450 (18.0" VIS)	TCO '95	0.26mm/dp	102khz	1600 x 1200@80hz	$599
17"	**VisionMaster Pro 400** (16.0" VIS)	TCO '95	0.25mm/AG	96khz	1600 x 1200@75hz	$498
	VisionMaster 400 (16.0" VIS)	TCO '95	0.26mm/dp	96khz	1600 x 1200@75hz	$438
	S702GT (16.0" VIS)	TCO '95	0.28mm/dp	96khz	1280 x 1024@85hz	$369
15"	**VisionMaster 350** (13.7" VIS)	MPR-II	0.28mm/dp	69khz	1280 x 1024@65hz	$219

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ComputerLife
Perfect Five-Star Rating
November 1997
VisionMaster Pro 17

PC MAGAZINE Best of 1997
January 6, 1998
VisionMaster Pro 17

Performance & Technical Excellence
March 1997
VisionMaster Pro 21

MW EDITORS' CHOICE
Six Time Winner
Jan 1997, Feb 1997, March 1997, April 1997, May 1997, June 1997
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PC MAGAZINE EDITORS' CHOICE
October 7, 1997
VisionMaster Pro 17
October 6, 1998
VisionMaster 450

WINLIST 1998
September 1998
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Dimâge EX ZOOM 1500

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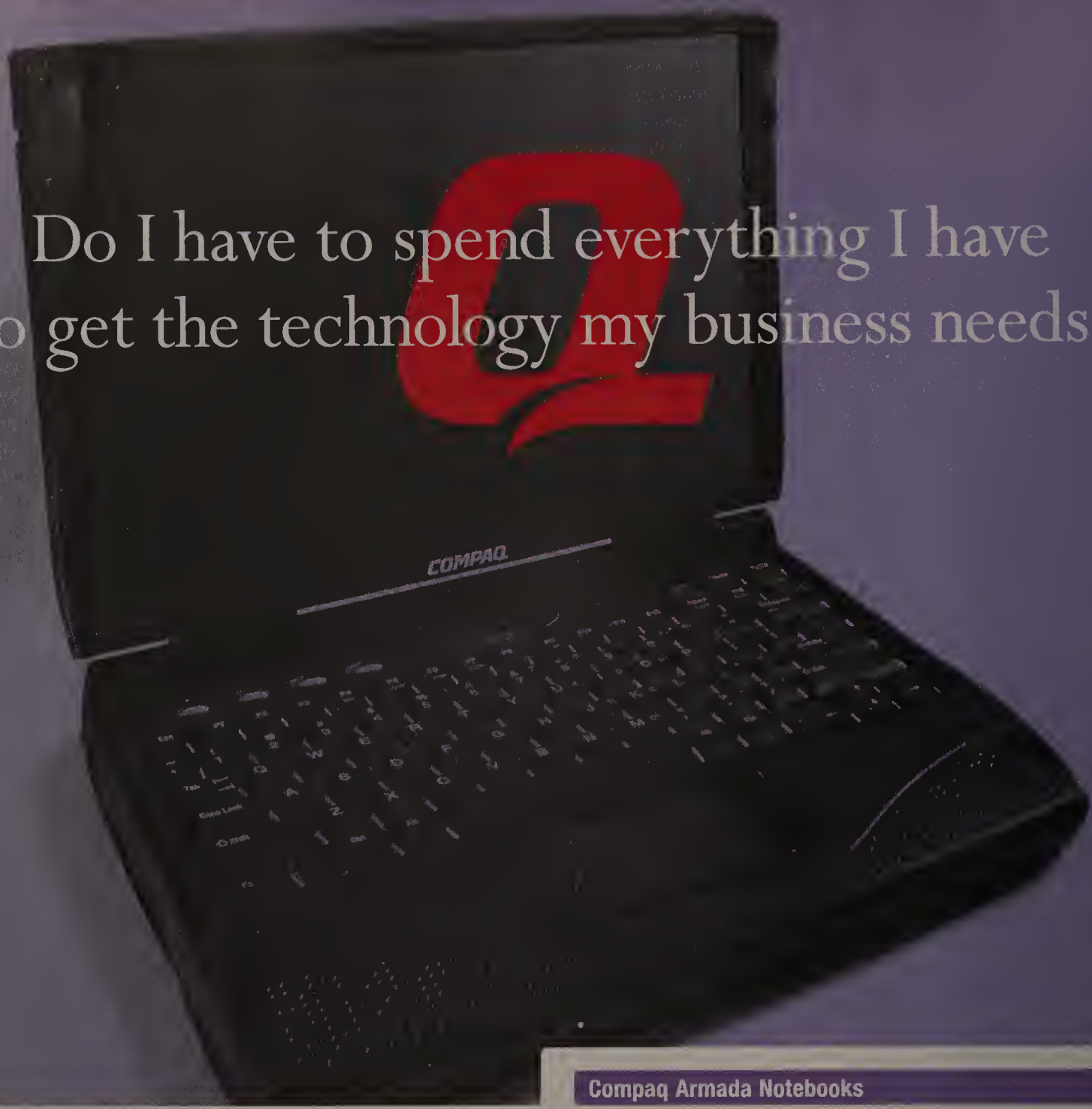
Do I have to spend everything I have to get the technology my business needs?



You want performance technology at prices you can afford. Well, Compaq has what you're looking for. Take the Compaq Armada 3500, for example. With features like the Intel® Pentium® II processor 266 MHz in a 4.4-lb. package, it can satisfy all of your business needs – including your budget. And you can order it by calling us directly or visiting our website. More technology and more ways to get it. It's what makes Compaq computers the best selling in the business.

Compaq Armada Notebooks

Armada 1573

The ultimate value in a fully integrated notebook.

$1,599*

Leasing Price: $54/Month[1]

- Mobile Intel Pentium Processor with MMX™ technology 233 MHz
- 3.2 GB[2] SMART Hard Drive
- 32 MB RAM (expandable to 96 MB)
- 12.1" CSTN SVGA display
- 20X Max[3] CD-ROM
- K56flex modem[4]
- Integrated AC Adapter
- Li-Ion battery
- 1-year limited warranty[6]

Armada 1700

The fully integrated notebook from Compaq that combines the latest key technology with uncompromising value.

$2,799*

Leasing price: $95/Month[1]

- Mobile Intel Pentium II Processor 266 MHz
- 4.0 GB[2] SMART Hard Drive
- 32 MB SDRAM (expandable to 160 MB)
- 13.3" CTFT (1024 x 768) display
- 24X Max[3] CD-ROM, optional DVD
- K56flex modem[4]
- Integrated AC Adapter
- Multibay design
- 1-year limited warranty[6]

*All prices shown are Compaq DirectPlus prices and are subject to change. Prices do not include applicable state and local sales tax or shipping to recipient's destination. [1]Leasing available through Compaq Capital Corporation (CCC) to qualified commercial customers, subject to credit approval and execution of CCC lease documentation. Monthly lease payments are based on 36-month fair market value lease, and do not include taxes, fees, or shipping charges. Offering subject to other restrictions and CCC reserves the right to change, alter, or cancel this offering at any time without notice. [2]For hard drives, GB = billion bytes. [3]20X Max CD-ROM data transfer rates may vary from 150 KB/s to 3000 KB/s; 24X Max CD-ROM data transfer rates may vary from 150 KB/s to 3600 KB/s; 32X Max CD-ROM data transfer rates may vary from 150 KB/s to 4800 KB/s. [4]Designed only to allow faster downloads from K56flex-compliant sources. Maximum achievable download transmission rates currently do not reach 56 KB/s, and will vary with certain line conditions. [5]Software is prebundled and will come with limited user documentation. [6]Some restrictions and exclusions apply. Call (800) OK COMPAQ for warranty details. ©1998 Compaq Computer Corporation. All rights reserved. Compaq, the Compaq Logo, Armada, ProLiant, Compaq Insight Manager, and SmartStart are registered trademarks and DirectPlus is a registered service mark of Compaq Computer Corporation. Intel, the Intel Inside Logo, and Pentium are registered trademarks and MMX and Celeron are trademarks of Intel Corporation. Other products mentioned herein may be trademarks or registered trademarks of their respective companies. Operating system pre-installed on all portable products. Compaq is not liable for editorial, pictorial, or typographical errors in this advertisement.

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ıe business computer for those who crave e latest industry-standard technologies, at ry aggressive pricing.

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ɜasing price: $43/Month[1]

- Intel Celeron™ Processor 300A MHz
- 4.3 GB[2] SMART II Hard Drive
- 32 MB SDRAM
- Compaq S700 17" (15.7" viewable) monitor
- Matrox MGA AGP Graphics
- Towerable chassis converts from desktop to minitower
- 3-year limited warranty[6]

Model 6350/10000/CDS

Provides the latest in performance technology in a simple, flexible design that configures to the workplace. The option is open for either a desktop or minitower system.

$1,979*

Leasing price: $67/Month[1]

- Intel Pentium II Processor 350 MHz
- 10 GB[2] SMART II Hard Drive
- 64 MB SDRAM
- Compaq S700 17" (15.7" viewable) monitor
- Matrox Millennium AGP Graphics with 8MB VRAM
- 32X Max[3] CD-ROM
- Towerable chassis converts from desktop to minitower
- 3-year limited warranty[6]

Model 6450/10000/CDS

Delivers true value by providing the ultimate in desktop quality and reliability. It offers a broad range of innovative, cost-effective, and flexible solutions.

$2,239*

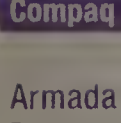
Leasing price: $76/Month[1]

- Intel Pentium II Processor 450 MHz
- 10 GB[2] SMART II Hard Drive
- 64 MB SDRAM
- Compaq S700 17" (15.7" viewable) monitor
- Matrox Millennium AGP Graphics with 8 MB VRAM
- 32X Max[3] CD-ROM
- Towerable chassis converts from desktop to minitower
- 3-year limited warranty[6]

Options

Deskpro EP Series:

- Additional 32 MB SDRAM Memory: **$79***
- 32X Max[3] CD-ROM: **$139***
- Upgrade to Compaq S900 19" (18" viewable) monitor: **$220***
- SuperDisk LS-120 Drive: **$119***
- Compaq C-Series 810 Handheld: **$499***



Compaq Armada Notebooks

Armada 3500

The lightest notebook from Compaq, weighing only 4.4lbs.

$2,799*

Leasing price: $95/month[1]

- Mobile Intel Pentium II Processor 266 MHz
- 4.1 GB[2] SMART Hard Drive
- 32 MB RAM (expandable to 160 MB)
- 12.1" CTFT SVGA display
- 512 KB L2 Cache
- Optional CD-ROM or DVD via Mobile Expansion Unit
- 4.4 lbs. and 1.3" thin
- Magnesium display for durability
- 3-year limited warranty[6]

Armada 7400

The lightweight, durable notebook delivering a combination of high performance, desktop equivalence, and mobility.

$3,499*

Leasing price: $119/month[1]

- Mobile Intel Pentium II Processor 300 MHz
- 6.4 GB[2] SMART Hard Drive
- 64 MB SDRAM (expandable to 256 MB)
- 13.3" CTFT (1024 x 768) display
- Powerful AGP graphics
- 24X Max[3] CD-ROM
- Optional ArmadaStation Expansion Base
- Around 6 lbs. and only 1.6" thin
- Magnesium casing for durability
- 3-year limited warranty[6]

Compaq Servers

ProLiant 800

The workgroup server that offers an innovative solution for customers looking for affordable next-generation performance.

$3,104*

Leasing price: $105/Month[1]

- Intel Pentium II Processor 350 MHz
- 4.3 GB[2] Wide-Ultra SCSI-3 Hard Disk
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- 10/100 TX UTP (embedded) Ethernet Controller
- 24X Max[3] CD-ROM
- Compaq Insight Manager, SmartStart[5]
- Compaq V55 15" (13.7" viewable) monitor, with 1-year warranty[6]
- 3-year on-site limited warranty[6]

Options

Armada 1700:

- Compaq Value Case: **$49***
- 32 MB Memory Module: **$89***

Armada 3500:

- Mobile Expansion Unit 24X Max[3] CD-ROM: **$199***
- Mobile Expansion Unit with DVD: **$399***
- Additional Li-Ion battery: **$209***

Armada 7400:

- ArmadaStation II Expansion Base: **$879***
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WE HELP WITH: Sony tech support ◆ Rebate snafus ◆ Auction problems

Sony's Free Support: Not for Life

"WHEN I BOUGHT my Sony VAIO computer, I was *promised* free lifetime telephone tech support." I've heard that lament, or ones like it, from several *PC World* readers recently. They're miffed by what appears to be a change in Sony's service policy, which requires users to pay $19.95 for telephone support after the first year of ownership.

But according to a spokesperson for Sony Electronics, the company made no such promise. "We never specifically told anybody they would get free lifetime telephone support," he explains.

According to Sony, the VAIO computers come with a one-year warranty only, including parts and labor. Many customers assumed (incorrectly) that the warranty included free telephone technical support beyond the first year. Since the company was new to computer sales and didn't have a large installed base to support, it didn't bother to enforce this one-year limit until recently—three years into selling computers. The company also points out that the $19.95 fee covers getting your problem resolved—no matter how many phone calls it takes. Online technical support remains free.

Get Your Rebate Yet?

HERE AT *PCW Advocate*, I receive more complaints about rebates than about any other topic. Evidently, many people never get the rebate checks they've been promised (see "Rebate or Rip-Off?" October, page 183). The problem isn't confined to any particular company, but because a lot of the complaints I've seen come from people who bought products at CompUSA, I spoke to Carol Elfstrom, a spokesperson for the Dallas-based retailer.

Elfstrom assures me the problem wasn't as bad as it could be. "These are vendor rebates," she says. "We work closely with the vendors so things go as smoothly as possible. But we don't control their fulfillment." Her advice to anyone tempted by a rebate offer: Check the offer's expiration date before you buy, follow the redemption directions carefully, and make copies of every piece of documentation before you mail it in. If you don't get your rebate within the expected time, call the vendor that made the offer. If you don't get anywhere with that company, and you bought the product at CompUSA, call 800/266-7872 and ask for the department that handles rebates. Someone there will help you deal with the vendor.

More AuctionBoard Woes

IN SEPTEMBER, I explained that some customers of the AuctionBoard site (www.auctionboard.com) weren't receiving goods they had paid for. At the time, AuctionBoard said the difficulties were due to a supplier that had gone out of business. Unfortunately, I'm still getting complaints from AuctionBoard customers who submitted winning bids but haven't received their goods. Also, the phone number we ran in September has been disconnected.

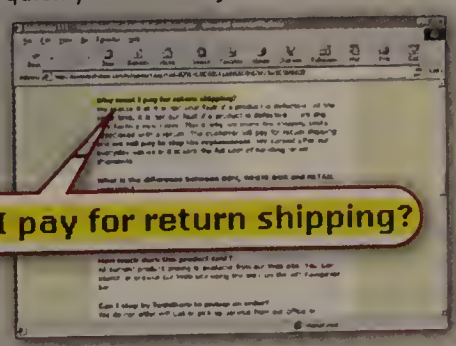
According to spokesperson Albert Lopez, the firm is still operating but has changed the way it does business. "We are focusing our operations into more of a classified-listing model (like EBay)," says Lopez. "We no longer work directly with vendors." The new phone number for AuctionBoard is 408/719-1981. Prospective bidders may want to find another auction site that responds more promptly to customer complaints.

ILLUSTRATION: JOHN CUNEO

THE FINE PRINT

Bargain Prices Online? Watch Out for Hidden Costs

SHOPPING FOR BARGAINS on the Internet has become a national pastime. But as the FAQs section of one of the big online computer discounters (shown here) reveals, hidden costs may be attached. If you buy a product at TechStore (www.techstore.com) that turns out to be defective, you must pay to ship it back for repair or replacement. For heavy items like PCs and monitors, that gotcha could quickly turn a bargain into a bad deal. According to Bejan Aminifard, CEO of TechStore, "We offer superlow pricing and cannot run a sustainable business while covering return shipping costs." Aminifard says this is a common policy at online stores. In contrast, most mail-order retailers—like Dell, Micron, Quantex, and TigerDirect—pay all shipping costs for defective items. It's something to consider when you compare prices.



GOTTEN A RAW DEAL?

Or a great one? Send PCW Advocate *the details at advocate@pcworld.com. We'll investigate complaints and publish items of the broadest interest. Christina Wood is a contributing editor for* PC World. ■

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COMPLETE HOME OFFICE SOLUTION

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PENTIUM® II PROCESSOR AT 350MHz

- 64MB 100MHz SDRAM
- *NEW* 12.9GB Ultra ATA Hard Drive
- 17" (15.9" viewable) 1000LS Monitor
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- Dell QuietKey® Keyboard
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- **Epson Stylus 600 Color Printer**Ω
- 3-Year Limited Warranty†
- 1-Year At-home△ Service

$1999

Personal Lease°: $75/Mo., 36 Mos.ø
Order Code #501114

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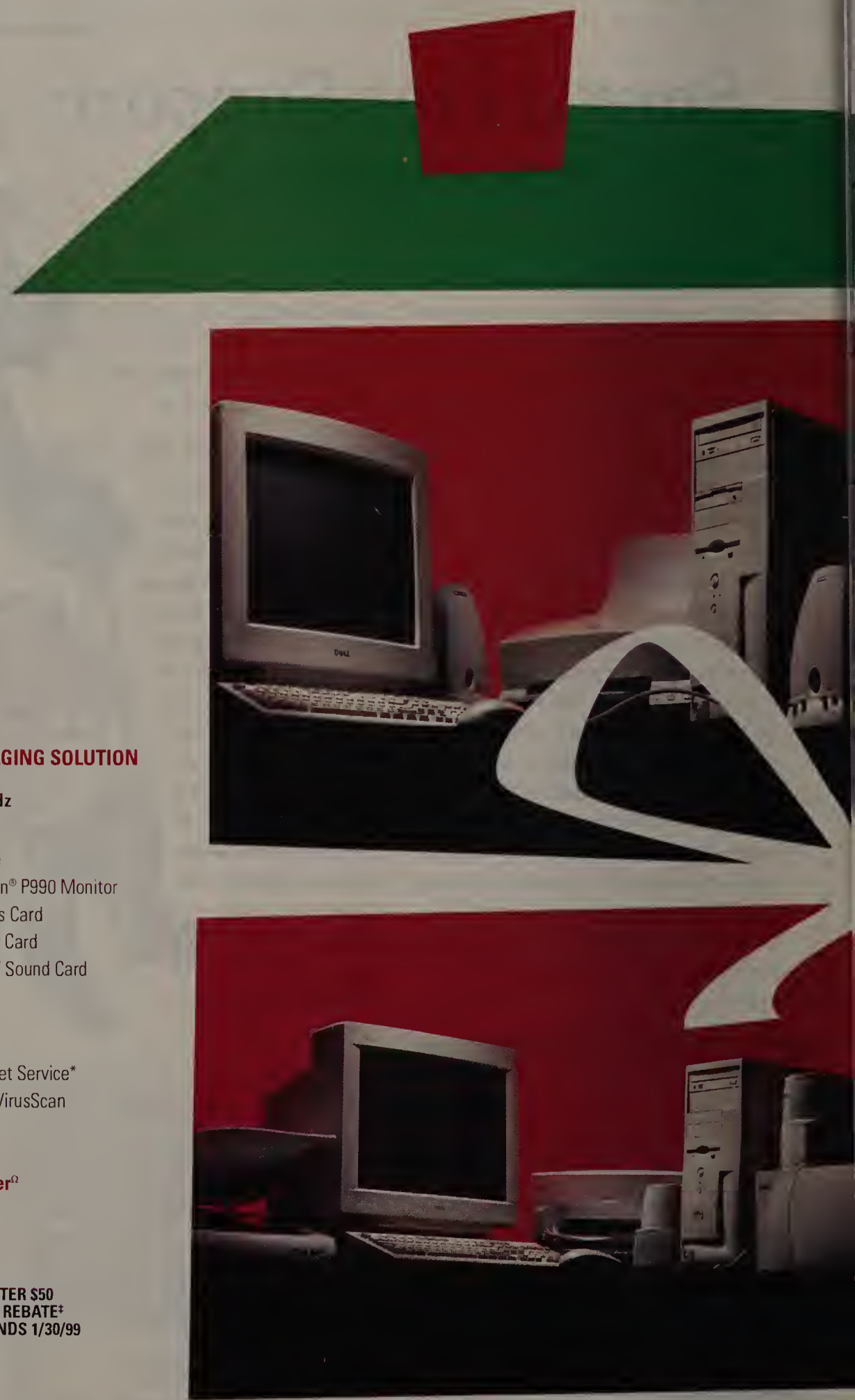
- 30-Day *FREE* ConnectDirect Internet Service*
- MS Home Essentials 98; McAfee VirusScan
- MS Windows 98/IntelliMouse®
- Dell QuietKey Keyboard
- **HP® 722C DeskJet® Color Printer**Ω
- **HP ScanJet 4100Cse**Ω
- 3-Year Limited Warranty†
- 1-Year At-home△ Service

$3249 **$3199 AFTER $50 MAIL-IN REBATE‡ OFFER ENDS 1/30/99**

Personal Lease°: $121/Mo., 36 Mos.
Order Code #501111



intel inside pentium® II PROCESSOR

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We've custom configured these four systems especially for home use. But if none of these systems are exactly what's on the wishlist, call us and we'll custom build one for you. And since Dell is the only company to win *PC Magazine*'s†† Readers' Choice Award for service and reliability for both desktops and notebooks two years in a row, that pleasant peace and goodwill feeling will last as long as you own your system. Call, or visit our online home store to order the solution that's right for you.

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- 3Com USR V.90π PCI WinModem
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- MS Home Essentials 98; McAfee VirusScan
- MS Windows 98/IntelliMouse
- Dell Comfort Key Keyboard
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- 3-Year Limited Warranty†
- 1-Year At-home△ Service

$2299

Personal Lease°: $86/Mo., 36 Mos.
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HOME VALUE SOLUTION
DELL DIMENSION V333c
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- Yamaha XG 64V Wavetable Sound
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You've Got (Too Much) Mail

PROBLEM *You have several e-mail accounts but no central place to manage them.*

SOLUTION *Use one of the latest e-mail packages or a Web-based service to aggregate your accounts.*

PHOTOGRAPH: SETH RESNICK

BRIAN BOCK OF BURLINGTON, Vermont, has a problem: He's inundated with e-mail. And we're not talking the useless spam variety, either. Bock, owner of an Internet marketing and Web design firm, maintains 22 separate e-mail accounts.

"It seems excessive," he says of all those accounts, "but it's really for clients. I'm monitoring their orders, catalog requests, and other things to see what's happening."

How does he manage them all? "The initial [idea] was to have multiple versions of Eudora 2.0 running," Bock says. "One version would check [clients'] e-mail and another would check mine." But as business grew, Bock found he had to launch three or four sessions of Eudora just to download, send, and view the various accounts. And because he couldn't easily organize information from the different in-boxes, he ended up forwarding messages to himself across accounts.

GET IT TOGETHER

BOCK'S SITUATION IS not unusual. In a recent survey by Internet research firm Jupiter Communications/NFO, over 30 percent of respondents said they use multiple e-mail accounts. Maybe you have an account at work, another at home, and one from a Web site that offers free e-mail, such as Yahoo Mail. Remembering to check them all can be a pain. You must also remember to send business correspondence from your work e-mail address and personal messages from your home address.

The good news is, makers of e-mail software have gotten the message, so to speak. Microsoft's free Outlook Express (included with Internet Explorer 4.0) and Qualcomm's $39 Eudora Pro 4.0 let you send and receive e-mail using several different accounts from one central mailbox. Netscape Communicator 4.5, which was still in beta as of this writing, will also offer this feature.

To set up multiple e-mail accounts in Outlook Express, select *Tools•Accounts* and choose the *Add* button. In Eudora Pro 4.0, select *Tools•Personalities*, then right-click in the *Personalities* window and select *New*.

If you use Outlook Express or Eudora, you'll need to know something about your e-mail servers to set up your software. The servers must conform to one of two major e-mail standards: Post Office Protocol 3 or Internet Message Access Protocol 4. Virtually all Internet service providers use POP3 to let their users retrieve messages from their servers. But some, most notably America Online, do not. If you have an AOL account, as Bock does, you'll need to check your AOL e-mail separately.

Once you know that you have a POP3- or IMAP4-compatible account, you need to tell your software the name of your mail servers. Typically, a POP3 e-mail account will have an address in the form of pop.*yourisp*.com for incoming e-mail and mail.*yourisp*.com for outbound mail. (Check with your ISP for specific instructions, since server names can vary.) ▶

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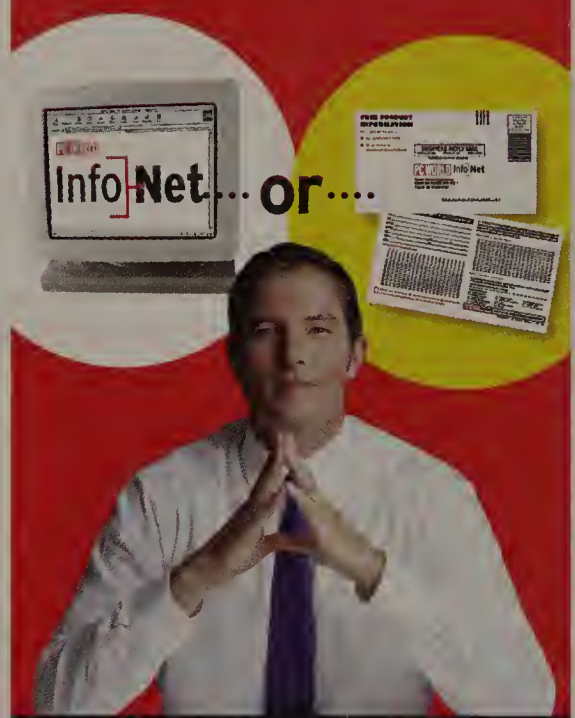

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After you've entered this information, you'll also need to provide your user name and password to get your e-mail.

If you want to corral the e-mail account you use at work, you'll probably need to ask your network administrator for server addresses. But don't be surprised if you're out of luck. For instance, although Lotus Notes has a feature that allows it to use POP3 servers, some companies may choose to leave the feature turned off. This means that you won't be able to access your e-mail from a program like Outlook Express or Eudora.

> Filters, rules, and other in-box management tools—besides running accounts—can help you manage the flow of e-mail.

What if you don't like Outlook Express or Eudora? What if you prefer to manage your e-mail over the Web, using services like Hotmail, RocketMail, or Yahoo Mail? You still can. Many free e-mail—or free-mail—services (including those just mentioned) let you access several POP3 e-mail accounts, but not necessarily IMAP4 accounts. This capability could come in handy if you like to check your e-mail anywhere you happen to find a Web connection—from libraries to airport kiosks.

FREE-MAIL HAS ITS LIMITS

BUT UNLESS YOU are already a convert to Web-based e-mail, you may discover that free-mail services have too many limitations to be satisfactory. For instance, they rarely permit you to access more than three or four different POP3 accounts. And if your company's POP3 server is protected by a firewall, services like Yahoo Mail won't be able to access it. Moreover, free-mail's Web-based interfaces and rudimentary filtering tools are often cumbersome, and managing folders and messages over a slow Internet connection will soon try your patience.

In the end, Bock upgraded his Eudora software to help manage all his e-mail. "It was the solution I was looking for, and it still serves me today," he says.

If you decide to use Outlook Express or Eudora 4.0 to aggregate e-mail from various accounts, take advantage of the software's other features. Filters, rules, and other in-box management tools help manage the flow of e-mail. For instance, messages sent to your personal account can automatically go to a "Personal" folder, while messages from a client might be funneled to a work folder.

"I have a huge number of messages that I check to make sure everything is going okay," says Bock. "But a lot of it I just don't have to see." Bock says he directs each client's e-mail into its own folder and checks on it when he has time.

THE IDENTITY YOU WANT

KEEPING MULTIPLE e-mail accounts lets you establish multiple identities online. Depending on the account you're using, you can apply different signature lines, return e-mail addresses, and user-friendly e-mail names to each account.

For Bock, who often deals with his clients' customers on their behalf, these capabilities are indispensable. "I want to appear as if I am part of the client's company," he says. "So if I reply to one of those messages, the response looks like it comes from brian-bock@thecompany.com, for example."

All these results can be achieved with a single e-mail software program, but sometimes it takes a little work. Bock complains that it can be difficult to dig around in Eudora's account configuration windows. Still, he's come a long way from where he started. Says Bock, "I remember thinking back then that it was kind of silly I couldn't do all this in one application."

Michael Desmond is a PC World *contributing editor. If you're having trouble resolving a PC-related hardware or software problem, we'd like to hear from you about it.* *See page 14 for contact information.* ■

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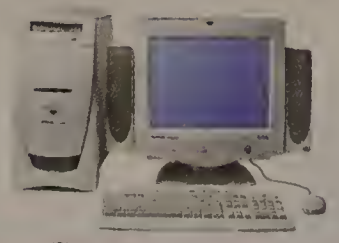

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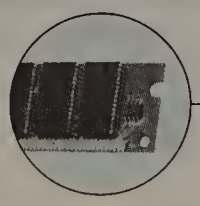

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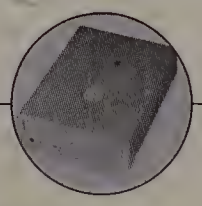

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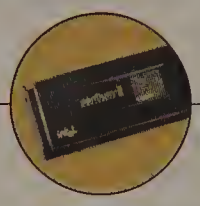

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COMPAQ

Office 97 SR2 redux ◆ Holey browsers, Batman! ◆ AMD K6-2/Windows 95 clash

Got Them Old Office 97 Blues Again

ABOUT READY TO toss your Office 97 CD in the microwave? No sooner had Microsoft posted its long-awaited Office 97 Service Release 2 bug-fix collection than reports of trouble started rolling in. Seems that if you managed to get the update installed, the patch worked as advertised, introducing only a couple of very obscure bugs. But in certain situations, the update simply refused to install, even if you had already installed the SR1 update as instructed.

Microsoft yanked the recalcitrant SR2 patch for repairs within ten days of posting it. By the time you read this, a version that installs under a broader range of conditions should be available at www.officeupdate.microsoft.com/Articles/sr2fact.htm. If you downloaded and tried to install the original version posted in September with no luck, give this new one a try (now that your hair's grown back). But if you successfully installed SR2, don't bother downloading all 23MB again—there's nothing new inside. (To find out which release you have, choose *Help•About Microsoft Word* from within Word.)

Windows 95 Stumbles Over K6-2

BUG You fire up Windows 95 on your new AMD K6-2 PC, only to receive this cheery message: 'Device IOS failed to initialize. Windows Protection Error. You must reboot your computer.'

Rebooting the computer usually makes the problem go away. AMD says the error occurs only with 350-MHz or faster processors, and is more likely to crop up on faster processors. It also turns up only under Windows 95 OSR 2, OSR 2.1, and OSR 2.5—not with earlier versions of Windows 95, nor with Windows 98 or NT.

FIX According to AMD, the error stems from the fact that Windows 95 OSR 2.*x* trips over the K6-2's processor frequency, and is not due to a flaw in the processor itself. The company's Web site (www.amd.com/products/cpg/k623d/win95_update_k6.html) suggests you call Microsoft technical support at 425/635-7000 and request the so-called "hotfix" referenced by Knowledgebase article Q192841 ("Windows Protection Error at boot time"). According to AMD, after Microsoft determines that you indeed have the problematic Windows/processor combination, Microsoft will send you a fix on disk. At press time, however, Microsoft said this was not the case, and that you should call your hardware manufacturer for any support for problems with AMD's processor.

IN BRIEF

Money 99 Update

MICROSOFT'S MONEY 99 may work wonders with your financial resources, but not so well with your computer's. Under Windows 95, the program can trigger 'low on resources' and 'out of memory' error messages. To download and install a 150KB fix, launch Money 99 and choose *Tools•Update Internet Information*. Exit and restart Money after the download is complete.

Ditto Tools

OCTOBER'S *Bugs and Fixes* reported that Iomega was hard at work on a Win 98 compatibility fix for its Ditto Max tape drives. The information URLs we listed are no more, but updated drivers and software are now available. Find the 6.74MB download at ftp://ftp.iomega.com/pub/english/ditto98.exe.

MORE BROWSER SECURITY FLAWS

IT'S DECEMBER, so it must be time for the latest browser security hole. This time, security researcher Dan Brumleve has discovered that all versions of Netscape's Navigator browser are vulnerable to several JavaScript hacks that allow bored-but-brainy Webnauts to view your Navigator browsing history. Meanwhile, a Spanish researcher discovered an even nastier hole in Microsoft's Internet Explorer that allows properly written Web page scripts to copy files from your hard disk to a remote system.

Netscape released a partial fix in Navigator version 4.07, but by the time you read this, a more complete update should be available. Netscape plans to include the fix in the forthcoming final version of Navigator 4.5 as well. Choose *Help•Software Updates* to upgrade your version. For more details, check out www.home.netscape.com/products/security. As we went to press, Microsoft was on the verge of releasing a patch for IE's security hole. Choose *Help•Product Updates* to download the fix, and visit www.microsoft.com/security for details on the problem.

As with most security flaws *Bugs and Fixes* has reported, the threat to your privacy is theoretical. Should you lose sleep over it? No. Should you download the fix? Yes. In the meantime, the paranoid can keep their surf histories, cookies, and files under wraps by disabling either browser's ability to execute JavaScript.

Files from this article are available on PC World Online at www.fileworld.com. Scott Spanbauer is a contributing editor for PC World. ■

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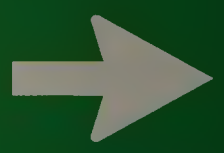

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FUJITSU ACCESSORIES

STORY #97:

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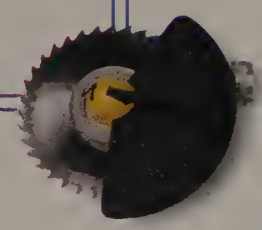

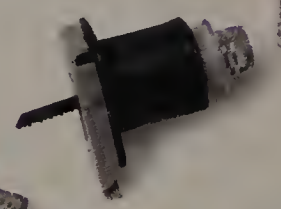

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TOP OF THE NEWS

How Cheap It Is:

TEST DRIVE

REMEMBER last spring, when the first $799 PCs seemed ridiculously cheap? What a difference six months makes. Just in time for the holidays, the first sub-$500 PCs are hitting the market. These brand-new machines target cash-strapped households, very small businesses, or families seeking a PC for the kids. If your expectations are in line with their bargain-basement profiles, these low-price units may well be worth a look.

Supercheap PCs are okay for simple tasks (spreadsheets, word processing, e-mail, and Web browsing); but they make compromises that many users will find unacceptable. By current standards, their performance is mediocre to poor. Network certification is lacking, a serious negative for many businesses. And 3D graphics acceleration is either nonexistent or too spotty to support 3D gaming (so much for keeping your teenagers happy).

We looked at three very inexpensive PCs: a preproduction version of Emachines' $499 ETower 300, and shipping units of Micro Electronics' $399 PowerSpec 2021 and PrecisionTec's $399 Gazelle GZW-200. Though none of these systems includes a mon-

A PC for Less Than $500

How Low Can Prices Go? Not much lower. But these three cut-rate systems deliver more value than you'd expect. ◆ **By Yardena Arar**

itor in the standard package, Emachines will add a 14-inch display for less than $100.

Can these astounding prices fall any further? Not in the immediate future. But you might see slightly more robust systems priced in the same range within a few months. Moreover, don't be surprised if one or more top-tier vendors launch name-brand $499 systems by next fall.

CUTTING CORNERS

ALL THREE TEST systems came with 32MB of RAM and a solid complement of multimedia gear: 12X–24X CD-ROM drives, 16-bit sound and 2D or 3D graphics. But compared to more expensive systems, these low-end models skimp in key areas: The hard disks are small, expansion slots and bays are few, and the CPUs are old and slow. Such lightweight configurations hurt performance, of course. The PowerSpec 2021, powered by a Cyrix MediaGX-233, ambled to the second-worst PC WorldBench 98 score we've seen since introducing the benchmark last spring—and the worst we've seen for a system with 32MB of RAM.

In addition, new technology has helped these vendors cut costs. Two of the PCs fold the graphics and audio subsystems into the motherboard or into the CPU itself, as opposed to deploying them in separate boards and chip sets. This practice, known as *integration*, saves space as well as money, but unfortunately it can also severely drain the already meager system resources of a cut-rate PC. The Gazelle's integrated graphics sys- ▶

JUST IN

Free PCs?

BY NEXT JUNE, National Semiconductor plans to ship a highly integrated processor, called the MediaPC, combining elements needed to put PC smarts into devices ranging from phones to entertainment devices. As a result, you could use, say, a VCR or DVD player with the new chip to surf the Net or balance a checkbook. National CEO Brian Halla predicts that future versions of this chip will become so cheap that they'll lead to "free PCs"—basic PCs supplied to customers by a service provider (like an online grocery store or bank) in return for service fees.

Office 2000 Update

A FINAL BETA of Microsoft Office 2000 will be available by December, a couple of months ahead of the shipping version. At ship time, expect to see five different versions of the suite: Standard (new versions of Word, Excel, Outlook, and PowerPoint); Small Business (substitutes Publisher for PowerPoint and throws in some extra small business tools); Professional (the Small Business version plus PowerPoint and Access); Premium (for Web fiends, with copies of PhotoDraw 2000 and FrontPage 2000); and Developer (Premium plus programming tools). ▶

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ILLUSTRATIONS: JAMES YANG; PHOTOGRAPHS: KEVIN CANDLAND; ICONS: JEFFREY PELO

tem, for example, uses 2MB of the 32MB of system RAM, leaving less memory for apps and multitasking while achieving poor graphics performance.

Other cost-cutting design choices limit upgradability. Theoretically, you can upgrade the integrated graphics chip set, but none of these systems have AGP slots to accept the latest 3D graphics cards.

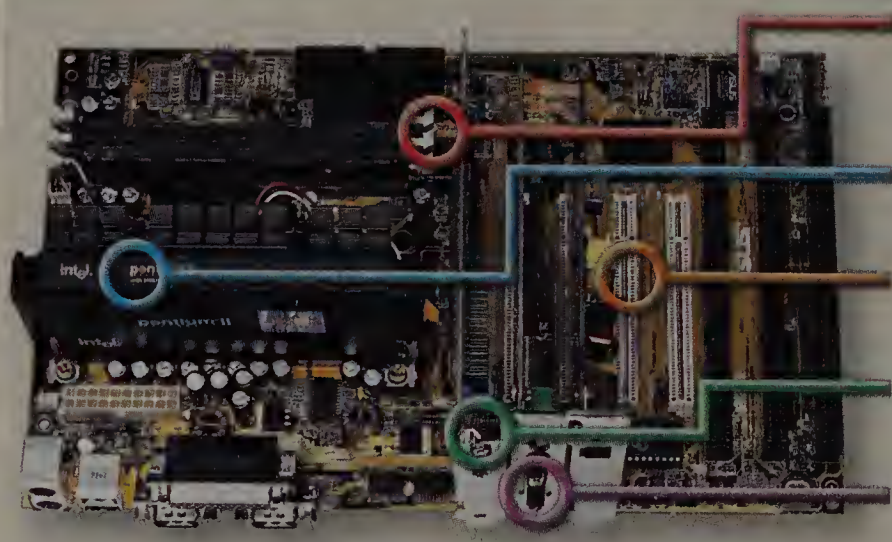
Scaled-back return policies, warranties, and tech support provide further savings to the PC makers. Micro Electronics offers only a limited 90-day warranty on the PowerSpec 2021, plus 90 days of toll-call phone support for units purchased in stores. In contrast, the company backs its pricier PowerSpec models with a full year's warranty and seven-day, 17-hour-a-day toll-free phone support during that period.

Business buyers on a shoestring won't like another cost-cutting measure: None of these systems is network certified. Emachines, however, claims that it has successfully tested its ETower with about 20 network cards.

Under the Hood: "Intel Inside" Will Cost You

MAKERS OF SUB-$500 PCs cut costs in ways that can affect performance and upgradability. Take peeks inside a $449 PC and a desktop system that sells for three times as much and see what's really going on. (The ETower below is a sibling of the unit tested in this story. Prices do not include monitors.)

$1389 MIDWEST MICRO OFFICE PRO-400



RAM: Ships with 64MB of RAM, expandable to 384MB on three DIMM memory slots.

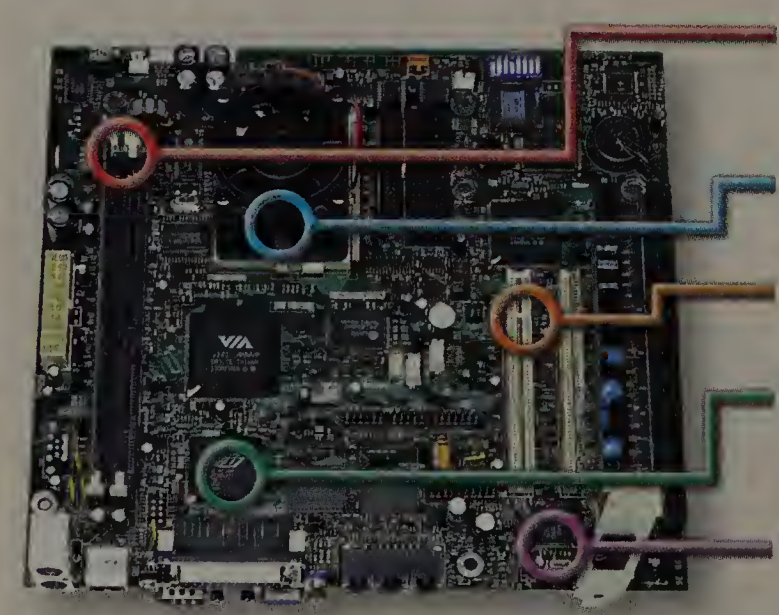
CPU: Intel PII-400 costs $482, more than the entire ETower 266.

EXPANDABILITY: Four open slots leave lots of room to grow.

GRAPHICS: STB Velocity 128 3D card with 4MB of VRAM.

SOUND: Ensoniq AudioPCI sound card costs vendors about $30, but delivers good sound.

$449 EMACHINES ETOWER 266



RAM: The ETower 266 ships with 32MB of RAM, which is expandable to 256MB on two DIMM slots.

CPU: The slower Cyrix M II-266 costs vendors less than $80.

EXPANDABILITY: The Emachines unit has only two open slots.

GRAPHICS: Integrated ATI 3D Rage IIc AGP chip set with 4MB of video RAM costs about $30 (vs. $60 for the STB).

SOUND: This integrated Crystal Audio chip offers lower-quality sound but costs vendors only about $5.

NOT SHOWN **Hard disk:** Office Pro, 6.4GB; ETower 266, 2.1GB. **Power supply:** Office Pro, 200 watts; ETower 266, 120 watts. (Higher wattage supports more peripherals.) **Open drive bays:** Office Pro, 3 external, 1 internal; ETower 266, 1 external, 0 internal. **CD-ROM speed:** Office Pro, 32X maximum; ETower 266, 24X maximum. **Software:** Office Pro, Microsoft Office 97 (Small Business Edition); ETower 266, Microsoft Works.

LESS POWER TO THE PEOPLE

HOW SLOW is a sub-$500 PC? Pretty slow, especially in the case of the two $399 machines. The PC WorldBench 98 scores for the PowerSpec and the Gazelle were a paltry 69 and 93, respectively. The $499 ETower, with its Intel Celeron-300 processor, scored a more respectable 122, but it's no speed champ. By way of comparison, the lowest-scoring system on this month's *Top 20 Budget Desktops* chart—the Polywell Poly K6266Mx, which packs an AMD K6-266 and 64MB of RAM—scored 145. Of course, the Polywell costs almost twice as much ($880 without monitor).

While these systems at least managed to limp through the various word processing, spreadsheet, database, and simple image-editing applications of our WorldBench 98 test suite, none of them performed satisfactorily on our graphics tests. The Gazelle and the PowerSpec simply couldn't run 3D games and applications; meanwhile, the ETower (the only machine with 3D graphics) ran them unacceptably slowly. In informal tests with Riven, a 2D game, the ETower

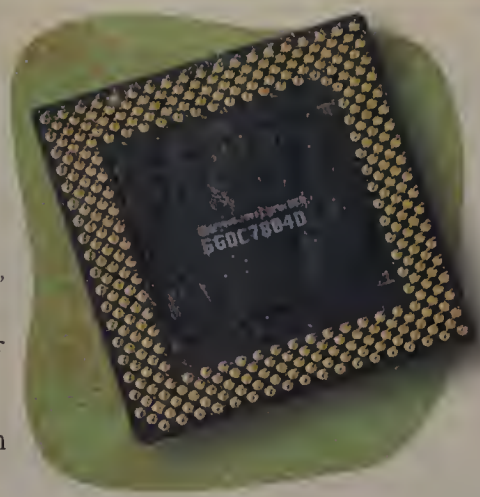
PHOTOGRAPHS: KEVIN CANDLAND

did reasonably well, but the other two systems' performance was intolerably poor.

WHEN CHEAP IS OK

FOR LESS DEMANDING apps, these machines are adequate. To get a sense of how one of these sub-$500 systems stacks up against pricier PCs on these applications, I compared the $399 PowerSpec to two higher-cost boxes: the $999 Micro Express MicroFlex-35A and the $1389 Mid-West Micro Office Pro-400. I hooked up each PC to an identical 15-inch monitor. Without knowing which system I was using at a given time, I performed routine tasks—working in Excel 97 and Word 97, installing an application, and viewing a small .avi video clip. Almost immediately I could tell the systems apart: Tasks executed nearly instantaneously by the most expensive system took a few heartbeats with the mid-range system, and noticeably longer with the PowerSpec.

But the PowerSpec was not unbearably slow, especially for handling word processing or browsing complex Web pages. A lot depends on what you're used to. For employees who've been working on a 386 or 486 PC, these low-price systems might be a good choice, especially if it's time to upgrade to Windows 95 or 98.



The Cyrix MediaGX CPU packs graphics, audio, and memory control into one chip. Integration allows for supercheap PCs.

WHAT YOU GET

THE ETOWER 300 costs $100 more than the others, but it delivers considerably more. Besides packing a considerably faster CPU (Intel's Celeron-300 cacheless budget chip), it's the only budget machine that includes a 56-kbps software-based WinModem (the other systems give you 33.6-kbps modems) and AGP graphics, supplied by an integrated ATI 3D Rage IIc chip set with 2MB of video memory on the motherboard. The ETower's 3.2GB hard drive is the largest of the three, and Emachines throws in a copy of Microsoft Works. On the negative side, you get only one free externally accessible bay (the PowerSpec also has only one); and the tiny, chintzy-looking, self-powered speakers produced predictably Victrola-esque sound. Emachines' support isn't stellar, either. ▶

DESKTOP PCs — HISTORICAL PRICING

PC Prices Bottom Out, But for $500 Who Can Complain?

IN 1996 AN entry-level PC cost $1500. For the same money today, you could buy three PCs—each one twice as powerful.

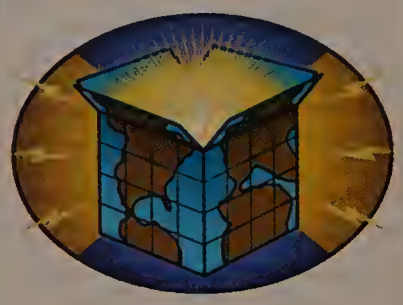
	December 1996	December 1997	December 1998
$500			WinChip-200, 32MB of RAM, integrated 2D graphics with 2MB of RAM, 2.1GB hard disk, 12X-24X CD-ROM drive, 14-inch monitor
$1000		Pentium MMX-166, 16MB of RAM, 2D graphics with 2MB of RAM, 1.6GB hard disk, 12X-16X CD-ROM drive, 14-inch monitor	Celeron-333, 64MB of RAM, 2D graphics with 4MB of RAM, 4GB hard disk, 12X-24X CD-ROM drive, 15-inch monitor
$1500	Pentium-100, 16MB of RAM, 2D graphics with 2MB of RAM, 1.3GB hard disk, 6X CD-ROM drive, 15-inch monitor	Pentium MMX-200, 32MB of RAM, 2D graphics with 4MB of RAM, 3.2GB hard disk, 12X-16X CD-ROM drive, 15-inch monitor	Pentium II-333, 64MB of RAM, 3D graphics with 8MB of RAM, 6.4GB hard disk, 12X-32X CD-ROM drive, 17-inch monitor
$2000	Pentium-133, 16MB of RAM, 2D graphics with 2MB of RAM, 1.6GB hard disk, 8X CD-ROM drive, 15-inch monitor	Pentium MMX-233, 32MB of RAM, 3D graphics with 4MB of RAM, 4.3GB hard disk, 12X-24X CD-ROM drive, 17-inch monitor	Pentium II-400, 128MB of RAM, 3D graphics with 8MB of RAM, 11GB hard disk, 12X-32X CD-ROM drive, 17-inch monitor

ILLUSTRATION: JAMES YANG

JUST IN

Car PCs Escape Gridlock

AFTER MONTHS of delays, the first PCs for cars should arrive any minute. By Christmas, Clarion will ship its $1299 AutoPC, an in-dashboard device controllable with voice commands. You can tell the AutoPC to switch radio stations or read (but not dial) phone numbers from the included PIM. The unit can play audio CDs or run CD-ROM-based software, such as mapping applications (not included). However, certain highly touted features—including the ability to receive traffic, weather, and news alerts; pages; and e-mail cost extra. You have to buy a $170 device and then pay $5 to $14 a month for each service. The first version won't send e-mail.



TidBytes

New Low for Color Lasers: QMS's new Magicolor 2 DeskLaser costs just $1799, the lowest price we've seen for this type of peripheral. The networkable printer offers 600-dpi color and monochrome printing, ethernet and parallel interfaces, and a 250-sheet input tray. Better Memory for Consumer Devices: Sony's Memory Stick, designed for cameras and other devices, is thinner, lighter, and much cheaper than Compact Flash cards, the existing alternative. The Memory Stick weighs only 4 grams and comes in 4MB and 8MB versions ($30 and $40, respectively). Some Sony digital camcorders already use this proprietary medium, but it's unclear when other compatible devices will follow.

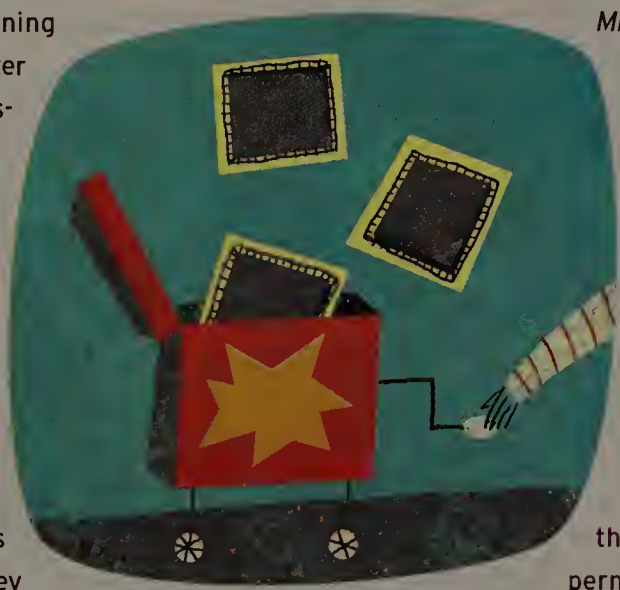
Coming Soon: A Cornucopia of Chips

WHETHER YOU'RE shopping for a high-end PC or an ultracheapie, you face a nagging fear: Will this thing be obsolete next month? That's the right question to ask, because Intel, the company that produces the vast majority of microprocessors, is turning the technology crank faster than ever. Nearly any system you buy today will be cheaper and more powerful next year. Here's a peek at what's in store.

Systems built around Intel's newest Celeron CPUs (300a and 333-MHz versions, which have integrated caches), are already good choices for thrifty buyers, and they will get even better. Early next year, Intel will roll out a Celeron-366 for $999 systems. By summer, expect to see a Celeron-400 with chip sets supporting a 100-MHz system bus. The faster bus will boost performance—much as Pentium II-based systems raced ahead when Intel added the 100-MHz bus to them.

Some Celeron-400 PCs will use a new chip set (the 810) that includes a modified version of the Intel i740 3D graphics accelerator on the motherboard. As a result, the PC won't need a separate graphics card, and system prices will sink even lower.

Competition in the $999 PC market should be fierce in 1999, with Intel's rivals—AMD, IDT, and Cyrix—releasing faster versions of their low-cost processors. Look for 380- and 400-MHz AMD K6-2 chips to reach the market by the end of 1998.



THE HIGH END

BY MARCH, new Intel 450- and 500-MHz PII chips with the Katmai instruction set will arrive. Katmai is Intel's code name for 70 new CPU instructions that are designed to speed graphics and audio processing.

What new apps will utilize Katmai? By and large, 3D games, says Linley Gwennap of *The Microprocessor Report*. Watch also for enhanced voice recognition programs and 3D visualization tools for databases. Other applications will appear, as well, but you may have to wait a while before you see them.

Katmai systems will be followed in short order by PCs with chips running at 533 MHz (or faster) and by the new 820 chip set, which permits a PC to operate with a 133-MHz system bus.

And if that's not enough speed for you, Intel chips will probably hit 600 MHz by summer—and those CPUs will include an integrated secondary cache that runs at full speed. (Today, the PII chip's secondary cache runs at half the speed of the processor.) Now, if you can just figure out what to do with all that power.

—Laurianne McLaughlin

The company provides free phone help for only 15 days after the first call. Once you're up and running, you must pay $1 per minute or $20 per incident for phone support, plus toll charges for a call to Texas.

For $50 less, Emachines sells another ultracheap PC, the ETower 266. This system includes a slower Cyrix M II 266 CPU and a smaller hard drive. We didn't test the ETower 266 for this article. (See "Under the Hood" for more details about its feature set.)

The Gazelle GZW-200—based on IDT's WinChip C6-200 CPU, with a 2.1GB hard disk—is the only PC of the three we tested to provide a 512KB secondary cache, which boosted its WorldBench 98 performance. Unfortunately, it's also the only one that lacks USB ports and comes loaded with Windows 95 instead of Windows 98. No productivity applications are bundled with the system. Integrated PCI graphics rely on 2MB of video RAM on the motherboard and another 2MB of system RAM. Sound is integrated, too.

PrecisionTec's support policies for the Gazelle include a one-year warranty on parts and service and a year of toll-free telephone support. However, it's call-back support—you call and leave a message and then wait for a response. My first trial call was returned within five minutes, but I waited almost two hours to hear back after a second call.

The PowerSpec, the real laggard of the bunch, relies on a Cyrix MediaGX-233 processor that integrates both audio and graphics hardware. It ships with 32MB of RAM, of which about 2.5MB is tied up by the integrated functions, reducing the available system RAM to 29.5MB. The PowerSpec has a 2GB hard disk, and comes with versions of Microsoft's Works, Money, and Entertainment Pack.

ETower 300
$499, Emachines, 877/566-3463, www.emachinesinc.com
INFONET NO. 753

Gazelle GZW-200
$399, PrecisionTec, 800/722-8284, www.gazellecomputer.com
INFONET NO. 754

PowerSpec 2021
$399; Micro Electronics; 888/480-4892, www.powerspec.com
INFONET NO. 755

AS CHEAP AS IT GETS?

PC PRICES SEEM to have bottomed out, at least for systems as we know them. Prices for basic components—motherboards, cases, power supplies, disk drives, keyboards, and CD-ROM drives—can't get much lower, and system makers probably can't survive on lower profit margins. In fact, Emachines president Stephen Dukker acknowledges that the new, Korean-backed company won't make much money on its first units.

Some analysts believe that top-tier vendors may offer systems at this price point next year. Compaq is already getting close. It's shipping a new PC (the Presario 2266) that will retail for $799—but you can get a $100 rebate simply by signing up for a free trial with Compaq's Internet service provider. This new Presario promises to be much more robust than any sub-$500 PC, with such strong components as a 300-MHz

Cyrix M II CPU, 64MB of RAM, a 512KB secondary cache, a 4GB hard drive, a 32X-maximum CD-ROM drive, and software-based 3D graphics.

Though prices are unlikely to dip below $399 anytime soon, you'll get more PC for your money if you wait a while. Within three to six months, new high-end CPUs from Intel and its competitors will continue to depress prices on existing chips.

Over the next couple of years, significant changes in architecture could produce a flock of even cheaper machines. Cyrix senior product marketing manager Ajay Misra thinks that in a year or two, integration will enable processors to eliminate the motherboard. The resulting "PC-on-a-chip" could be used to power $299 machines for such specialized uses as Internet access. Vendors could knock about $50 off the price by offering systems with alternative operating systems like Linux or even Windows CE.

For the time being, however, $399 and $499 PCs are likely to remain the cheapest available. If your budget allows, the Emachine ETower 300 promises a substantial performance gain over competing bargain machines—and the best chance of succeeding on a network—for the extra $100. If $399 is all you can spare, the Gazelle GZW-200 offers modest performance and adequate support, while the PowerSpec offers a better software bundle. Just temper your expectations. You won't obtain race-car performance at go-cart prices.

SUB-$500 PCs — TEST REPORT

Emachines' PC Towers Over Other Ultracheapies

SYSTEM	CPU	RAM (MB)	Secondary cache (KB)	PC WorldBench 98 score
Emachines ETower 300 ($499)	Intel Celeron-300	32	0	122
PrecisionTec Gazelle GZW-200 ($399)[1]	IDT WinChip C6-200	32	512	93
Micro Electronics PowerSpec 2021 ($399)	Cyrix MediaGX-233	32	0	69
Average of four $799-$999 Win 98 PCs	various	various	various	169
Average of four $1199-$1499 Win 98 PCs	various	various	various	185

Word 97 · Word Pro 97 · Excel 97 · 1-2-3 97 · Paradox 8.0 · Picture Publisher 7.0

TEST PC WORLD CENTER

HOW WE TEST We tested all systems with PC WorldBench 98, PC World's application-based benchmark. A higher PC WorldBench score is better. For more details on our benchmark and how we run it, see PC World Online (www.pcworld.com/testing). Data based on testing conducted by the PC World Test Center. All rights reserved. [1]The Gazelle was the only system tested running Windows 95.

Pick Up the Phone, Send an E-Mail: New Services Work in a Pinch

WANT TO ENJOY the freedom of sending and receiving e-mail without being shackled to your desktop or weighed down by your notebook PC? Want to turn idle commuting time into productive computing time? Don't we all.

PC World tested two new services—General Magic's Portico and Planetary Motion's CoolMail—that claim to make e-mail as close as the nearest telephone. These are the first services to let you hear *and* respond to e-mail from a phone handset. Unfortunately, the voice-recognition and voice-synthesis technologies they rely on are a poor substitute for the vastly more dependable keyboard-and-display routine. An especially problematic shortcoming for business users is that both services work only with Internet-based e-mail: Neither Portico nor CoolMail can provide you with easy access to corporate, LAN-based e-mail. Portico does work with America Online mail; CoolMail says it will support AOL by year's end.

VIRTUAL ASSISTANT

PORTICO, WHICH bills itself as a virtual personal assistant, is the more robust of these two services. It uses a voice interface: You talk, it responds. Besides deciphering your e-mail, it can read contact, calendar, and to-do–list information from such popular personal information managers as Microsoft Outlook. You can even introduce changes to your calendar and your to-do list over the phone.

Moreover, Portico offers an array of phone and voice mail features. The service assigns you your own personal toll-free number that accepts phone calls. Portico can forward calls to other locations—your cell phone or hotel room, say. After the $50 setup fee, the basic monthly cost ranges from $20 to $150 or higher, depending on your overall connect time.

To handle e-mail chores, you call a toll-free number, enter your password, and then issue commands to a computerized "assistant." You can ▶

ILLUSTRATIONS: JAMES YANG

listen to messages, skip ahead, forward a message to a fax machine, and even send voice replies as .wav file attachments. Portico also permits you to filter e-mail by sender or keyword to spare you from having to wade through your in-box.

But caveats abound. First, the voice interface is far from perfect. You must memorize a list of navigational commands, which can be inconvenient for new or occasional users. Moreover, Portico misunderstood some commands from my occasionally static-ridden cell phone. And while the hands-free, all-voice interface is theoretically ideal for calling from a car, I found it dangerously distracting to use while driving.

And listening to the voice-synthesized e-mail quickly becomes tedious. Pronunciation was understandable most of the time, but Portico reads everything: On a forwarded message, it delivers the routing header—one character at a time. Finally, though the assistant will inform you when an e-mail message has attachments, it can't read these over the phone. For that job, you have to download attachments from your Portico Web site.

NOT QUITE FREE E-MAIL

COOLMAIL OFFERS several levels of service: I tested the Bronze version, which is free. Here's how it works. Every time you call CoolMail and enter your password on the phone keypad, you hear a 10-second commercial, which I found no more annoying than listening to a standard voice mail message. To navigate the service, you enter commands on the phone keypad, a definite problem when driving. The free version of CoolMail doesn't forward e-mail to a fax machine. And as with Portico, you must download file attachments to your CoolMail Web site; CoolMail declines to read them to you over the phone.

CoolMail allows you to respond to e-mail in several ways: You can e-mail a voice reply as a .wav file attachment. You can choose from a limited selection of canned text replies, along the lines of "Thanks, got your note. Will be in touch." Or for 2 cents a word, you can dictate a phone reply that the service converts into text. The messages I dictated came through without any spelling errors, including the proper names.

Unfortunately, CoolMail Bronze also has hidden fees and limitations. Replies sent to non-CoolMail accounts cost 10 cents each. Though you get 60 minutes of toll-free access to CoolMail each month, calls beyond that run 10 cents per minute. And finally, message storage space is limited to 2MB; after that, messages bounce back to the sender.

As with Portico, I had trouble navigating. The keypad interface was usable, but when I pushed a wrong key, CoolMail stopped in its tracks. I had to call back and start over. Because of the attention CoolMail requires, I would recommend against using it on the highway. Signing up for CoolMail on the vendor's Web site is relatively painless, but it's unduly intrusive. You must supply three pages worth of personal information, including data on your age, employment, salary, and marital status. This demographic information is not sold or given out, but it determines which ads you'll hear.

In addition to Bronze service, CoolMail offers four fee-based packages. The top-of-the-line Platinum service costs $15 per month and includes message filtering, dictation for text replies, a personal toll-free number, 5MB of storage, as well as other phone and faxing features. (When you get this service, you buy your way out of the 10-second ads and the survey.)

SAY WHAT?

THE TECHNOLOGY behind these services, though in its early stages, is moving forward. Vendors are developing LAN-based products that better support corporate e-mail. In fact, CoolMail Corporate should be available by the time you read this.

For now, be aware of the limitations before you sign up. CoolMail Bronze's price is right for a trial run, but if you want advanced phone features, Portico may be a better bet. As for me, I plan to keep lugging around my trusty notebook for a while longer.

—*Michael S. Lasky* ▶

PHONE E-MAIL SERVICES — FEATURES COMPARISON

CoolMail and Portico Turn Phones Into E-Mail Machines

SERVICE	Price	Key features	Comments
CoolMail Bronze 877/266-5624 www.planetarymotion.com	free basic service; fees for some e-mail reply and access options	phone keypad interface, multiple reply options	Inexpensive; inconvenient phone-keypad navigation, minimal message filtering; sign-up requires personal information.
Portico 800/486-4342 www.portico.com	$50 setup charge; $20–$150 per month (or more, depending on connection time)	voice interface, message filtering, advanced voice mail and phone features	Interface allows hands-free operation and access to popular PIM software; expensive; requires navigation commands.

ILLUSTRATION: JAMES YANG

We can custom-build a gift for anyone.

(Not even the folks at the North Pole can claim that.)

Finally something the entire family can share. (Besides the bathroom.)

Just think: one gift that can make everyone happy. Let us build you a computer with hardware and software customized for every family member: the budget keeper, the gaming fanatic, the Internet surfer, etc. All it takes is a low monthly payment with no money down. And after two years, as your family grows, or just grows up, you have the option to trade your Gateway™ PC in toward the purchase of a new one[1]. In the meantime, we'll always be standing by with flexible service and support, 24 hours a day, seven days a week, online, on-call or by fax. Now the only thing you need to worry about is who gets to use the computer first.

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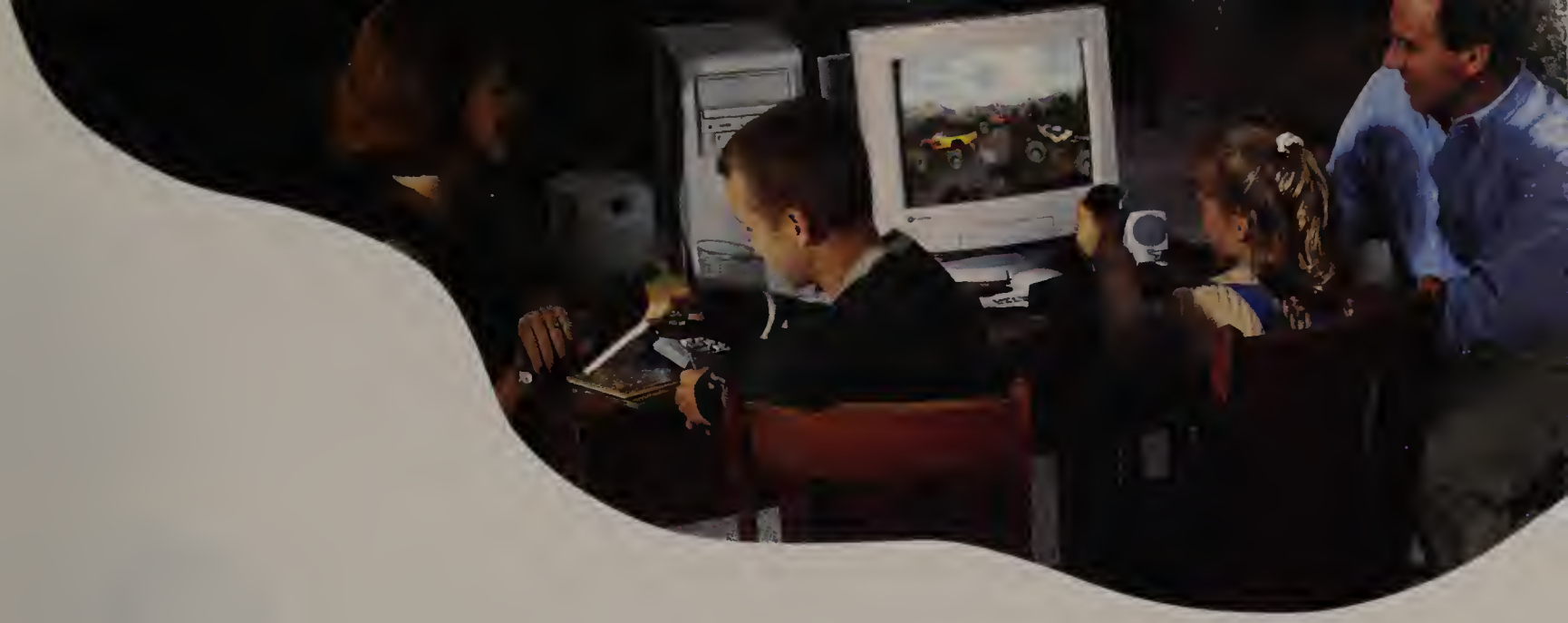

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The Family Foundation G6-350

- Intel® Pentium® II Processor 350MHz with 512K Cache
- 64MB SDRAM
- EV700 .28 Screen Pitch 17" Monitor (15.9" viewable)
- 8MB AGP Graphics
- 10GB Ultra ATA Hard Drive
- DVD-ROM Drive & MPEG2 Decoder
- 3.5" Diskette Drive
- SoundBlaster® AudioPCI™ 64D
- Boston Acoustics® BA635™ 3-Piece Speaker System
- U.S. Robotics® 56K² Voice Winmodem
- Micro-Tower Case
- MultiFunction Keyboard & Mouse
- Microsoft® Windows® 98 & MS® Home Essentials™ Software
- Gateway Gold℠ Service for G-Series PCs*

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- 16MB AGP Graphics
- 10GB Ultra ATA Hard Drive
- DVD-ROM Drive & MPEG2 Decoder
- 3.5" Diskette Drive
- SoundBlaster AudioPCI 64D
- Boston Acoustics BA635 3-Piece Speaker System
- U.S. Robotics 56K² Voice Winmodem
- Mid-Tower Case
- MultiFunction Keyboard & Mouse
- MS Windows 98 & MS Home Essentials Software
- Gateway Gold Service for G-Series PCs*

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The Far-Flung Family SOLO® 3100LS (FireAnt)

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- 32MB SDRAM (expandable to 96MB)
- 2.5MB 256-Bit Graphics Accelerator
- Integrated DVD-II Drive
- Integrated V.90 Modem
- External 3.5" Diskette Drive
- 2GB Ultra ATA Hard Drive
- Lithium Ion Battery & AC Pack
- USB Port, CardBus & Zoomed Video Support
- Integrated 16-Bit Sound & Stereo Speakers
- Leather Portfolio Carrying Case
- Full-Size Keyboard
- EZ Point® Pointing Stick
- MS Windows 98 & MS Office 97, Small Business Edition plus Bookshelf® 98
- LapLink® V.7.5 for Windows 98 & McAfee® VirusScan
- Gateway Gold Service for Portable PCs*

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$2499**

Add on specific packages to customize your Gateway PC to fit your family's needs.

- **Audio Entertainment -** Philips® CD-RW (CD-Rewritable) Drive, Boston Acoustics MediaTheater™ 3-Piece Speaker System **$339**
- **Digital Photo Pack -** Epson® Photo PC™ 550 Color Digital Camera, Philips CD-RW **$419**
- **Family Entertainment -** Kid's BackPack™ Software, Microsoft Action Titles, MS SideWinder® Precision Pro Joystick **$249**

Internet access provided by gateway.net℠ for $14.95/mo.³

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Actually, there is a gift they won't be bored with by New Year's.

This holiday, give your kids a gift that won't end up in the back of the closet. We'll custom-build a Gateway™ PC for children of any age, even as young as preschool, with games and learning software, as well as special hardware like the kidBoard™ Keyboard. And as they get older, you can upgrade your Gateway system to match new interests and offer new challenges. In fact, with the Your:)Ware℠ program[1], you have the option of trading your PC in toward the purchase of a new one after two years. Too bad you can't do the same with your kids' clothes.

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The Budding Scholar G6-333C

- Intel® Celeron™ Processor 333MHz with 128K Cache
- 32MB SDRAM
- EV700 .28 Screen Pitch 17" Monitor (15.9" viewable)
- 4MB AGP Graphics
- 3.2GB Ultra ATA Hard Drive
- DVD-ROM Drive & MPEG2 Decoder
- 3.5" Diskette Drive
- SoundBlaster® AudioPCI™ 64V
- Boston Acoustics® BA635™ 3-Piece Speaker System
- Telepath® 56K² Winmodem
- Micro-Tower Case
- MultiFunction Keyboard & Mouse
- Microsoft® Windows® 98 & MS® Home Essentials™ Software
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- Gateway Gold Service℠ for G-Series PCs*

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$1499**

The Personal Tutor G6-400

- Intel Pentium® II Processor 400MHz with 512K Cache
- 64MB SDRAM
- EV700 .28 Screen Pitch 17" Monitor (15.9" viewable)
- 16MB AGP Graphics
- 10GB Ultra ATA Hard Drive
- DVD-ROM Drive & MPEG2 Decoder
- 3.5" Diskette Drive
- SoundBlaster AudioPCI 64D
- Boston Acoustics BA635 3-Piece Speaker System
- U.S. Robotics 56K² Voice Winmodem
- Mid-Tower Case
- MultiFunction Keyboard & Mouse
- MS Windows 98 & MS Home Essentials Software
- Gateway Gold Service for G-Series PCs*

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- **Grade School Advantage -** Family Reference Bundle, KidBuilder Grades 1-4, OR KidBuilder Grades 5-8 **$169**

Internet access provided by gateway.net℠ for $14.95/mo.³

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Speed, power and other holiday treats.

If you know someone (like yourself) who always insists on having the hottest technology, a Gateway™ PC can make the holidays happier. Gateway offers the new Pentium® II Xeon™ processor at 450MHz — the fastest on the market. And thanks to the Your:)Ware℠ program[1], you'll always keep up with innovations. You put no money down, make low monthly payments, and then, after two years, you have the option to trade it in toward the purchase of a new (*i.e.*, faster) PC. So put a Gateway computer at the top of your holiday wish list.

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Blast Off G6-450

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- 128MB SDRAM
- VX900 .26 Screen Pitch 19" Monitor (18" viewable)
- 16MB AGP Graphics
- 10GB Ultra ATA Hard Drive
- DVD-ROM Drive & MPEG2 Decoder
- 3.5" Diskette Drive
- **Iomega® ZIP BUILT-IN™ Internal Drive**
- SoundBlaster® AudioPCI™ 64D
- Boston Acoustics® BA635™ 3-Piece Speaker System
- U.S. Robotics® 56K² Voice Winmodem
- Mid-Tower Case
- MultiFunction Keyboard & Mouse
- Microsoft® Windows® 98 & MS® Home Essentials™ Software
- Gateway Gold℠ Service for G-Series PCs*

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Hyperspace GX-450XL

- Intel® Pentium® II Xeon™ Processor 450MHz with 512K Cache
- 128MB SDRAM
- VX900 .26 Screen Pitch 19" Monitor (18" viewable)
- 16MB nVidia® RIVA TNT™ AGP Graphics
- TV/FM Tuner Card
- 16GB Ultra ATA Hard Drive
- DVD-ROM Drive & MPEG2 Decoder
- Philips® CD-RW (CD-Rewritable) Drive
- 3.5" Diskette Drive
- SoundBlaster AudioPCI 64D
- Boston Acoustics Digital MediaTheater™ 3-Piece Speaker System
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- 8GB Ultra ATA Hard Drive
- Two Lithium Ion Batteries & AC Pack
- Two USB Ports, CardBus & Zoomed Video Support
- NTSC/PAL Video Input & Output
- 16-Bit Wavetable Sound & Altec Lansing® Speakers
- V.90 56K² Windows Modem
- Deluxe Leather Case
- Port Replicator
- EZ Pad® Pointing Device
- External Battery Charger
- MS Windows 98 & MS Office 97, Small Business Edition plus Bookshelf® 98
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And don't forget some cyber stocking stuffers.

We don't just make customized computers. We also help people get more out of the ones they already have. Choose from our huge list of software bundles designed for everyone from serious gamers to inquisitive kids. Or upgrade your system with a joystick or a digital camera. We have something for everyone on your holiday gift list. Even if it doesn't fit in a stocking.

Gateway Select Software

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(Cantent suitoble for oges 17 and alder.)
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- Hexen II™
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Extreme Gaming II $99
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- The House of The Dead™

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- With system purchase $200
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KidBuilder Preschool-Kindergarten $99
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- Reader Rabbit's® Kindergarten
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KidBuilder Grades 1-4 $99
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- Slam Dunk Typing™
- (Plus 4 mare titles)

KidBuilder Grades 5-8 $99
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- Success Builder™: Algebra 1
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- (Plus 4 mare titles)

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- Carmen Sandiega Word Detective™
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- Money
- Ward
- Works
- Entertainment Pack: The Puzzle Collectian

Microsoft Professional Resource Suite $99
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- Encarta Virtual Globe 98
- Expedia™ Streets 98
- Expedia Trip Planner 98
- Publisher

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- Plus! Far Kids
- Scholastic's The Magic School Bus™ Explares the Rainforest
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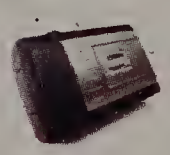
- DreamWarks Interactive: Chaos Island-The Lost World™

Peripherals

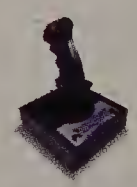


Epson® PhataPC™ 550 Digital Camera $199

Epsan PhataPC 700 Digital Camera $599

Canan® BJC®-4300 Calar Bubble Jet Printer $159

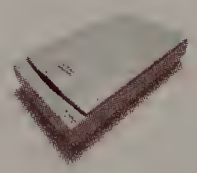
Epson Stylus® 640 Color Ink Jet Printer $199



Thrustmaster® Top Gun™ USB Jaystick $49

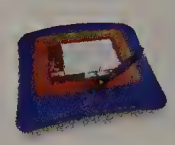
APC® Back-UPS® Office Uninterruptible Pawer Supply (UPS) $99

APC Back-UPS 500 UPS $159



APC Back-UPS Pro 650s UPS $299

Visioneer® PaperPort™ 6100 Color Scanner $179



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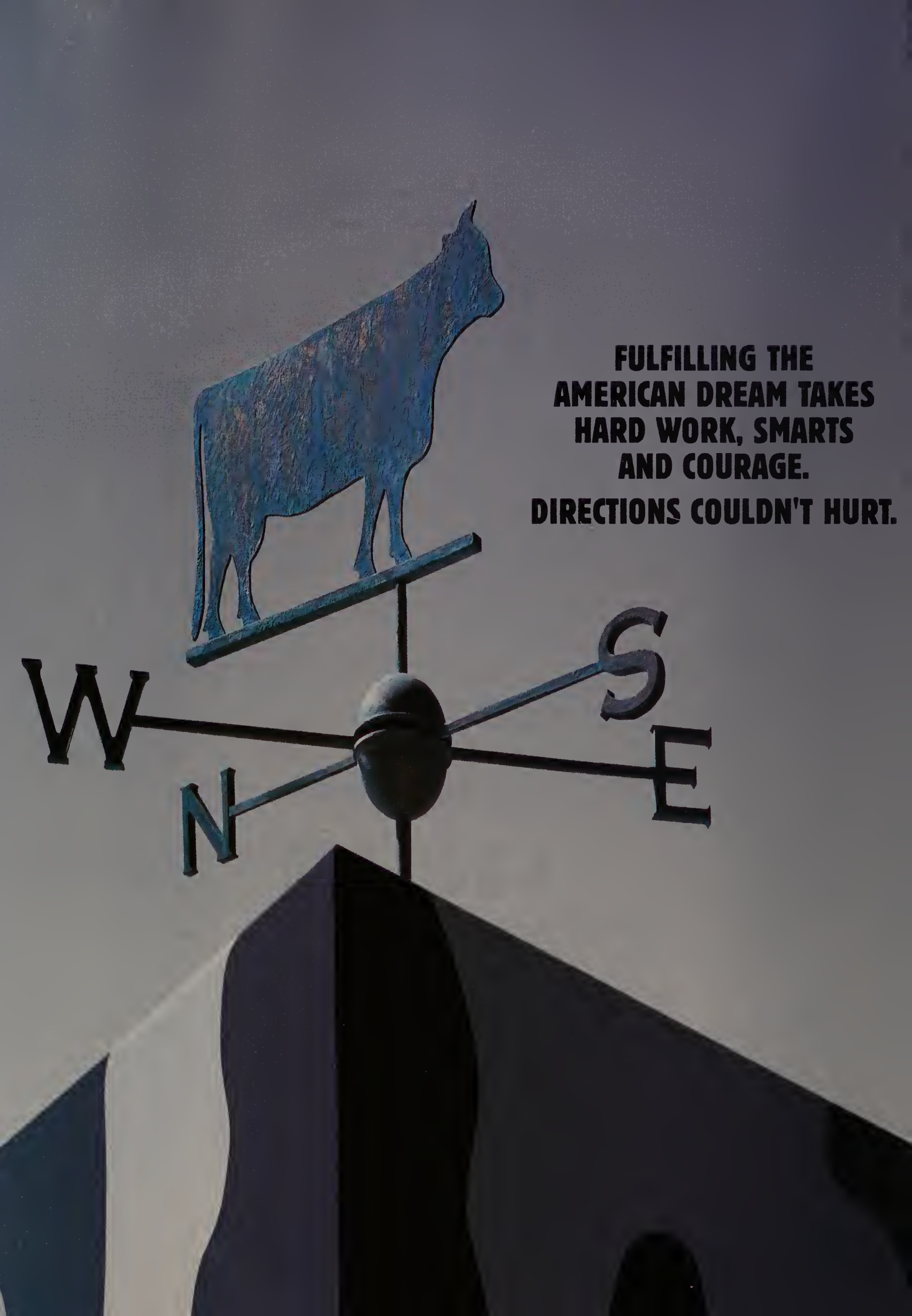

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View Bills With a Browser, Pay With a Click

ANALYSIS

PAYING BILLS ONLINE is a pain: You get the bill in the mail, go to your bank's Web site, and fill out a form that explains how much you owe and to whom. After you click the button to initiate payment, your bank may take days to actually transfer the funds; in some cases, it'll have to send a paper check by snail-mail.

No wonder banks and bill senders are hailing something called *bill presentment*. Currently offered by only a few banks around the country but expected to proliferate over the next 12 months, bill presentment lets vendors send bills electronically. Here's how it might work: When you log on to your bank's Web site, you'll see a list of pending bills. Select one for a summary of the month's charges. Click again for the details—individual calls on your phone bill, individual charges on your credit card. If it all looks okay, you just click a button, and the bank settles the bill instantly via electronic payment.

Sounds great, all right. But as bill presentment programs roll out across the country, they have several hurdles to clear before you'll want to ditch your checkbook.

> **Bill presentment** programs have several **hurdles** to clear before you'll want to ditch your **checkbook.**

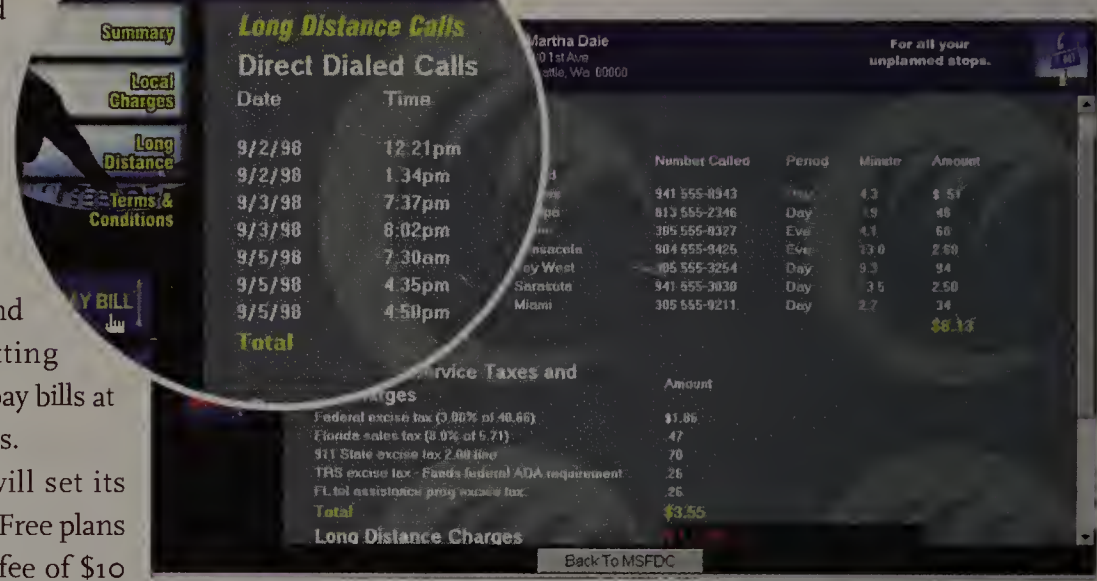
VENDORS WANTED

TO BEGIN WITH, banks and billers have to get with the new program. Two companies—CheckFree (www.checkfree.com) and TransPoint (www.msfdc.com)—are leading the way. For several years, CheckFree has offered end users an online bill payment service, through banks. TransPoint is newer, the result of a joint venture among Microsoft, First Data, and Citibank. Both act as intermediaries, conveying billing data from billers to the banks. CheckFree and TransPoint will offer bill presentment services at their own Web sites, but they would rather stay behind the scenes, letting users view and pay bills at their banks' sites.

Every bank will set its own fees. CheckFree plans to charge a flat fee of $10 a month, covering a customer's first 15 payments; each additional 5 payments will cost $2.50.

CheckFree has programs up and running with Chase Manhattan, Wells Fargo, and Banc One; it expects to have similar arrangements for its other 300 client banks around the country operational by late next year. TransPoint is still in the pilot phase. Agreements have been inked with Wells Fargo, Norwest, Banc One, Mellon Bank, Citibank, and Merrill Lynch; the company will begin its nationwide rollout in the first quarter of 1999.

Note the overlap: Individual banks will likely work with CheckFree, TransPoint, and any other company that can deliver billers. That's because online bill presentment won't work unless masses of vendors participate, presenting charges and accepting payments electronically. Initially, bill presenters are focusing on utilities and financial services: CheckFree's billers include AT&T, BellSouth, Chase Credit Card and Mortgage, and Southern California Edison. TransPoint vendors include Browning Ferris Industries, GE Capital, The Hartford Financial Services Group, J.C. Penney, Mobil, and Shell Oil.



BILLS PRESENTED electronically can supply the same level of detail you get on paper versions, including individual calls on your phone bill.

STANDARDS NEEDED

IF BANKS, billers, and presentment services like CheckFree and TransPoint can agree on a common language for delivering bill information electronically, it won't matter who sends you a bill or who's presenting it. The Open Financial Exchange standard (or OFX) is the leading candidate to become the lingua franca of online bill payment. Coauthored by Microsoft, CheckFree, and Intuit, OFX would also permit consumers to download billing data to their personal finance programs: Quicken and Microsoft Money are both OFX compliant. OFX addresses security concerns, too. The standard is compatible with Secure Sockets Layer (the leading Internet security protocol) and digital certificates (guaranteeing the identity of billers and payers).

If proponents of presentment can assuage consumers' fears about online security, the key issue will become critical mass—getting enough billers to participate. The average consumer receives 12 bills a month, but most banks today can at best present bills from two or three vendors in a given region.

If you're lucky, your billers will get involved early and establish presentment links with your favorite financial institution. If not, you'll probably want to hang on to that old checkbook and pen for a couple of more years.

—Dan Miller ▶

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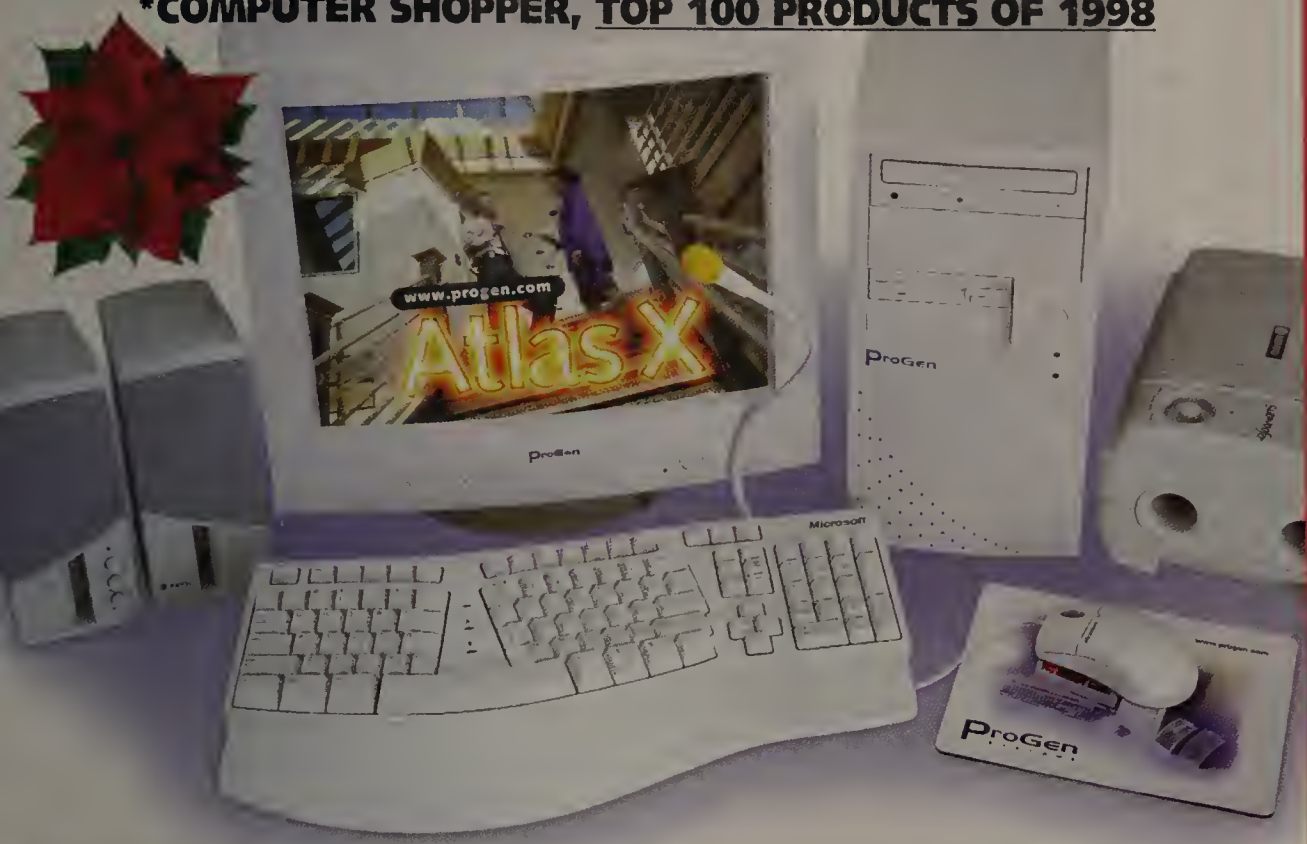

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Trade-In Time: Micron and Gateway Offer Dollars for Your Old PC

CONSUMER ALERT

THE HARSH truth about buying a computer: Your PC is obsolete the instant you open the box. Now several leading mail-order PC vendors are trying to relieve some of the sting by allowing buyers to trade in their old systems for new ones.

The latest PC maker to dangle a trade-in deal is Micron. Its new Mpower program invites small and medium-size businesses to trade in Pentium-class PCs (from any one of ten major vendors, including Apple) for a shiny new Micron box. Earlier this year, Gateway launched YourWare, a similar program that targets individual consumers; YourWare offers trade-in rebates, too, but only for Gateway systems. For its part, Dell has quietly been offering trade-in programs to big businesses for years.

Like leasing, trade-in policies help buyers keep the latest technology on their desktops. But beware: You could end up spending more money packing and mailing your old PC than you reap in rebate.

ARRAY OF SERVICES

MICRON'S MPOWER program covers an array of services, including financing, leasing, and trade-in credit for old PCs. Rebates are based on the *Orion Blue Book*, a standard guide to the value of used computers. Micron will pay for shipping costs and will even send you the necessary packaging. The company also accepts older systems (486s and worse)—which it recycles—but only in quantities of five or more.

Gateway's YourWare program is far more consumer-focused: For as little as $50 a month, you get a PC or notebook (from the G-series, Destination, or Solo product lines) plus access to the Internet via gateway.net. You also gain the right to trade in your old PC toward a new purchase, anytime between two and four years from its purchase date. Gateway credits you the used PC's *Orion Blue Book* value.

Dell has been offering to take in old PCs for years. The company's "asset recovery services" take two forms: First, Dell will pay "competitive" rates for used 486/50s and above. The catch: It will do so only for customers who turn in 20 "units" (CPU, monitor, laptop, or printer) or 10 complete systems at a time. Second, customers with older systems or fewer units can send them to Dell for recycling. The charge: $25 to $35 per unit.

SHRINKING PC VALUES

SO DO TRADE-INS make any sense? That depends on your system's age, since a computer loses its value more rapidly than almost any other consumer product. Roger Rohrs, publisher of the *Orion Blue Book*, estimates that the fair market value of a two-year-old computer is 15 to 20 percent of its original price. So a Micron Millennia P200 (with 16MB of RAM and a 1.6GB hard drive) that cost $2000 two years ago is worth $300 to $400 on today's market. Apply that amount toward a new Micron, and you've got a good discount.

But if that system is three or more years old, the rebates shrink dramatically: The same Millennia might be worth only $100—or less. Read the fine print, and you will discover that, though Micron pays for shipping at trade-in time, the company charges a "processing fee" of $25 per system up front to cover the eventual cost of shipping and inspection. Meanwhile, Gateway charges for the entire amount of shipping. Throw in the cost of the labor required to pack your PC, and the rebate might not cover the expense of returning it.

LEASING VS. TRADE-IN

THOUGH THE specifics vary, in practice, trade-in and leasing programs yield similar results. In both cases, you send the old PC back and (the vendor hopes) then upgrade to the latest technology. If you always want the latest, greatest machine on your desk, which option makes more sense?

It's impossible to generalize, but consider one situation. Let's say you want a Millennia P450 minitower from Micron. The company would lease the $1799 system to you for about $62 a month, for a total cost over two years of $1488. If you bought it with a credit card charging 13.9 percent interest and paid it off over those same two years, you'd pay about $86 a month—or $2064 overall. Even if you received a 20 percent rebate (roughly $360), leasing is a better deal. But if you keep the PC for three years, the balance shifts: You'd pay $2232 to lease, $2210 to buy, and about $2100 to buy and then trade it in.

These numbers will vary significantly depending on your particulars—the interest rate you're paying, the duration of your loan, how long you intend to keep the PC, and what you plan to do with it once that time is up. So get out your magnifying glass and slide rule, read the fine print, and do the math for yourself.

—*Dan Miller* ▶

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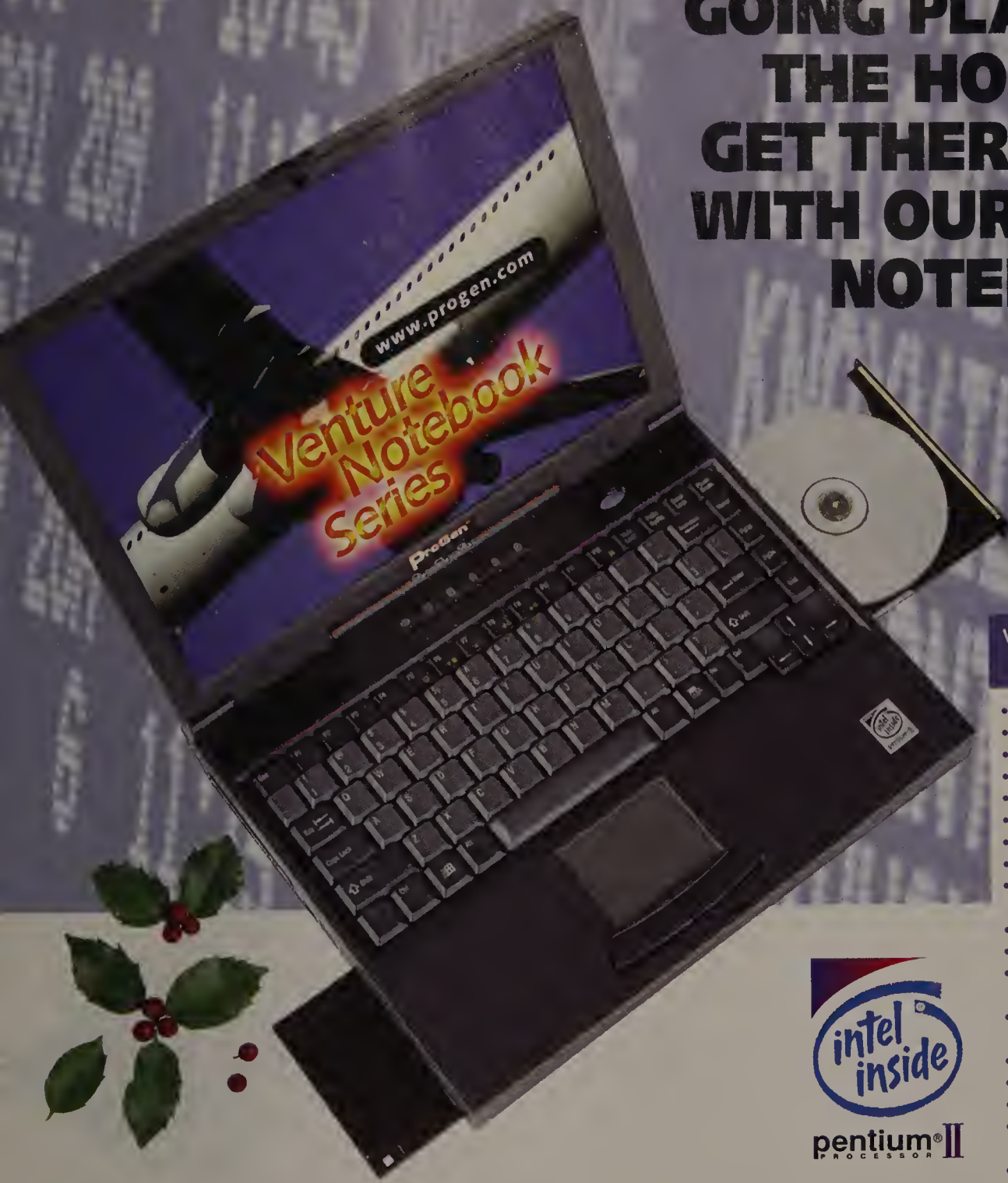

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LEFT: Apple's iMac. RIGHT: Packard Bell's Celeron-333-based Multimedia 945 PC.

iMac vs. Pentium: No Points for Good Looks

REALITY CHECK

SURE, THE iMac is a cool-looking computer. And the translucent aquamarine box is helping Apple regain profitability. But interim CEO Steve Jobs' boast that the iMac is faster than the quickest Pentium II is pure hype—and it falls apart under scrutiny.

To see whether Apple would make believers out of us, we pitted the iMac against two Intel-based PCs: a pricier Pentium II-400 system and a Celeron-based machine that costs about $300 less than the iMac. The results: In its base $1299 configuration, the iMac finished last in each of our application tests. The system was nearly as easy to use as the company claims, but its poor performance means Apple failed in its core mission.

When Apple launched the iMac in August, the fastest PCs you could buy ran on Intel's 400-MHz Pentium II. Could a cheaper computer built around Motorola's 233-MHz Power PC G3 processor dust a high-end Pentium, as Jobs claimed? Forget about it.

With 32MB of RAM (its standard shipping configuration), the iMac got clobbered on our Excel and 5MB-image Photoshop tests; in fact, the slower of our two test PCs, a Packard Bell Multimedia 945 with an Intel Celeron-333 processor, finished ahead of the iMac by 55 percent and 80 percent, respectively, on these tests. And when we compared the iMac to our high-end system, a $1799 Micro Express MicroFlex-c400A with a Pentium II-400 CPU, the contest was, well, no contest. The iMac took more than three times as long to finish a standard series of Excel operations, even after we doubled its RAM.

The standard iMac fared better on our word processing and game tests, losing to the Packard Bell by only 8 percent, and matching its frame rate running Quake. But when the iMac went up against the PII-400–based MicroFlex, the results were brutal. (All applications were optimized for the appropriate platform.)

EASE OF USE

GETTING THE iMac out of the box—and yourself onto the Internet—is almost as easy as Apple claims. A well-designed setup sheet helps new users get started. And we successfully connected to Earthlink, Apple's default Internet service provider, in just minutes.

But pitfalls are all too common. If you want a different ISP, for instance, getting connected is trickier. And there's no printed user's guide to help resolve hardware problems.

Sure, the iMac is eye-catching, but Apple left a lot out of that elegant box. For starters, it comes with no floppy drive (though you can buy an external USB version for $70 or so), no free drive bays, and only one available expansion slot.

GOOD VIDEO

THE IMAC'S all-in-one case includes an integrated, nonupgradable 15-inch monitor with a flat-screen display clearly superior to the Packard ▶

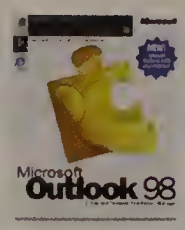
SYSTEM COMPARISON

An Extra $300 Gets You...

FEATURE	Apple iMac	Packard Bell Multimedia 945
Price	$1299	$998
CPU	G3-233	Celeron-333
Installed RAM (MB)	32	64
Secondary cache (KB)	512	integrated 128
Hard drive (GB)	4	4
Graphics adapter	integrated ATI Rage IIc	integrated ATI Rage Pro Turbo
Installed video RAM (MB)	2	2
Monitor size (inches)	15	15
Multimedia	speakers and microphone integrated into monitor	speakers, subwoofer, and microphone integrated into monitor
Floppy drive	none	1.44MB
Network adapter	10/100 ethernet	none

PHOTOGRAPH: KEVIN CANDLAND

Look what the mouse dragged in.



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iMAC PERFORMANCE — TEST REPORT

Celeron and Pentium II Leave iMac Behind

TEST PC WORLD CENTER **HOW WE TEST** For Excel 97 (on the PC) and Excel 98 (Mac), we inserted data into a stock-forecasting workbook and recalculated. For Word 97 and Word 98, we opened an HTML file, opened a large text document, and then autoformatted, searched and replaced, and saved the file with a different file name. For Photoshop 5.0 on both platforms, we applied filters and effects, followed by image resizing and color conversion operations, on a 5MB image and on a 20MB image. For Quake I 1.09 and Quake II 3.14, we ran a demo and recorded the frame rate.

Bell's 15-inch display, yielding even focus and sharp, readable text. The integrated video subsystem includes an ATI Rage IIc 3D processor and 2MB of SGRAM; but like the budget PC, it lacks a 3D accelerator for high-end gaming. The iMac's speakers purportedly emit "SRS surround" sound, but they played music CDs poorly: too much treble, weak bass, and no way to adjust either.

We added RAM during testing and found that upgrading the iMac is a chore, even for an experienced user. To get to the empty memory slot, we had to painstakingly disassemble the case, with little help from the documentation.

Still, Apple has earned a reputation over the years for above-average system reliability—a point to consider when you shop.

That brings us to our bottom line: The iMac may be a handsome sentimental favorite, but all the good looks and good intentions in the world can't make up for slow application performance, poor sound quality, and no upgrade path. Apple tells users to "think different." We advise Apple to "think again."

—Susan J. Silvius

Microsoft Resurrects Dumb Terminals

ANALYSIS

AN IMPORTANT yet obscure new version of Microsoft Windows—called Windows NT Server 4.0 Terminal Server Edition—may radically change the way you work.

You don't install this version of Windows NT on your desktop. Instead, the IS folks who maintain your company's computer and network install it on a central server. In place of a PC, they put a stripped-down, or "thin," client system on your desktop. Thereafter, applications like Word and Excel, which now run on your desktop PC, instead run on the server. The thin client does nothing but handle screen updates and transmit your mouse and keyboard clicks.

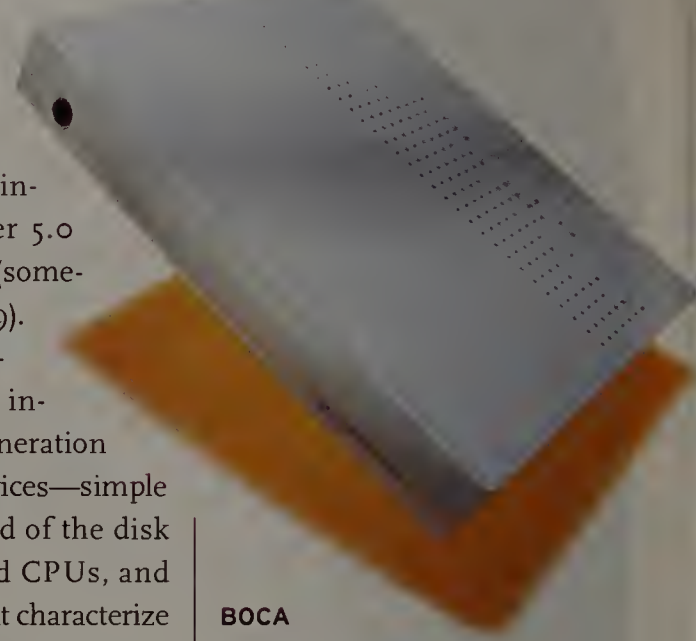
Sound familiar? Terminal Server represents a return to the same centralized approach to computing that was standard back in the 1970s and early 1980s, when dumb terminals and green screens ran off minis and mainframes. Terminal Server promises to reduce operating costs and make managing a company's computers easier. But if one of these thin clients shows up on your desk, should you be grateful or go ballistic?

THE NEW BREED

ANNOUNCED in May 1997, Microsoft's Terminal Server operating system was officially launched in June 1998. The multiuser features of Terminal Server will also appear in Microsoft's Windows NT Server 5.0 when it arrives (sometime in mid-1999).

Terminal Server has already inspired a new generation of thin-client devices—simple systems stripped of the disk drives, high-end CPUs, and expandability that characterize general-purpose PCs. A small amount of RAM provides sufficient space to run a local operating system (typically Windows CE 2.1); the operating system code itself is stored in ROM or memory, allowing for software upgrades.

HP's GT200, for example, is about the size of a Tom Clancy novel—and gets started a lot faster, booting into a Windows NT screen in just over 5 seconds. The GT200 could have been smaller still, if not for the back ports that connect ethernet cables, keyboards, mice, monitors, printers, and other devices. The HP's proprietary OS does little but boot up the system ▶



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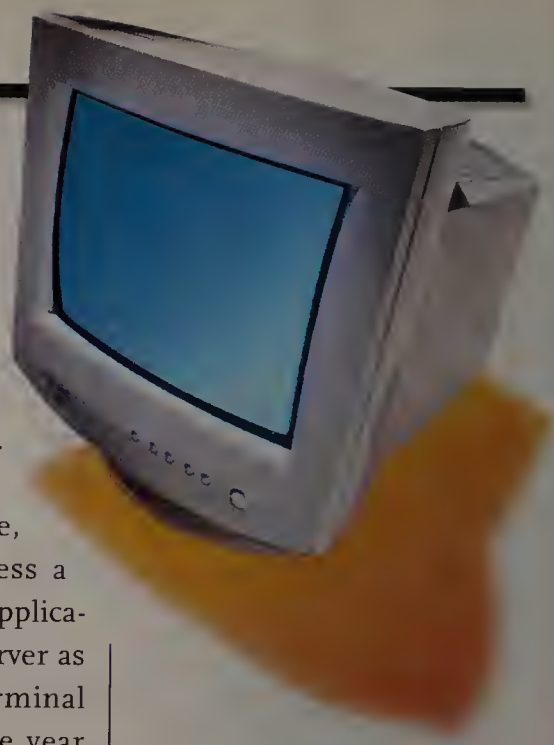
and manage communications with the server.

Thin clients also take more intriguing forms. The Key Tronic ClienTerm 1000, for example, puts a Windows terminal inside a standard 101-key keyboard. The Wyse Winterm 3515SE is essentially a 14-inch CRT monitor with an integrated Windows terminal (flat-panel LCD and 15- and 17-inch CRT versions are available, too). You'll also see thin clients, ranging in price from $600 to over $1000, from Network Computing Devices and Boca Research.

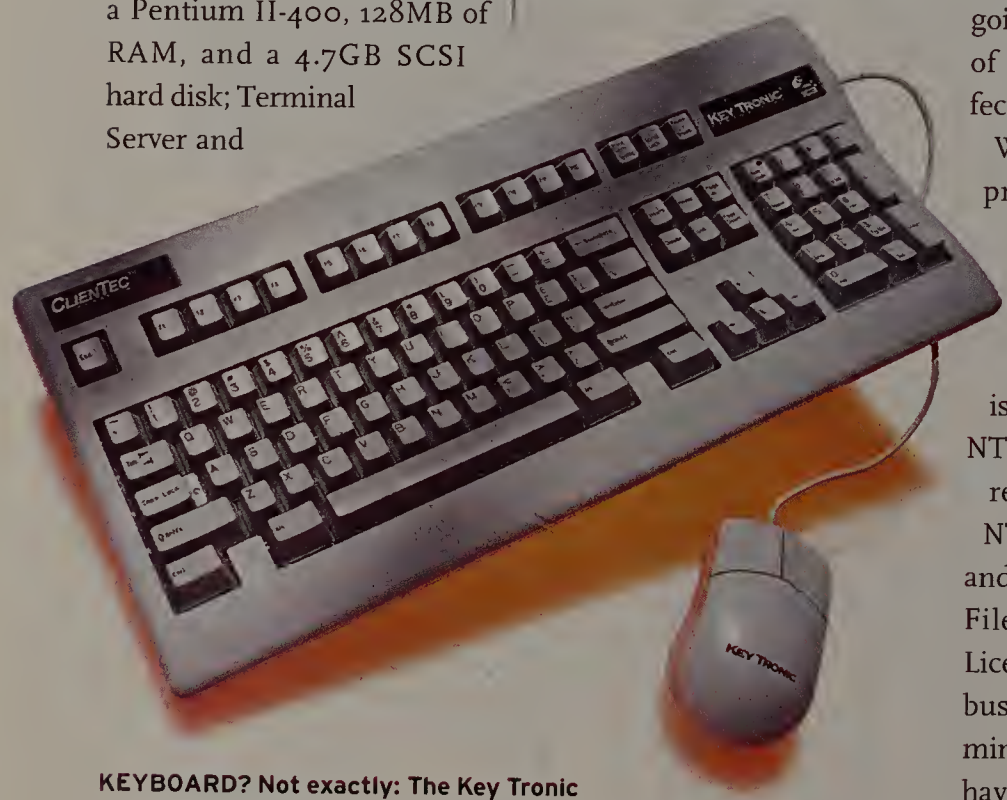
In many cases, you'd be hard-pressed to distinguish between Windows apps running on a local system and the same apps running on a thin client connected to Terminal Server. When I connected an HP GT200 client to an HP NetServer LC 3 (equipped with a Pentium II-400, 128MB of RAM, and a 4.7GB SCSI hard disk; Terminal Server and NT Server have the same hardware requirements) running Terminal Server, the client automatically logged on to the server and quickly displayed a standard Windows NT desktop. Programs loaded swiftly over the 10-mbps ethernet connection, and the system responded almost instantaneously to mouse clicks and keystrokes. Word and Excel documents (complete with large graphics) loaded and scrolled quickly, and showed little performance degradation. Gaming, video work, and graphics-heavy editing, however, are another matter: The necessary flood of graphics data is simply too much for this architecture. When I tried playing an AVI video off the fast SCSI hard disk, I got the equivalent of a grainy slide show. And because the HP terminal uses just 256 colors, the images became dithered.

Still, theoretically, a properly configured group of servers could distribute Microsoft Office 97 and other productivity applications to hundreds of individual desktops—in fact, I wrote part of this article on a Windows terminal client that was running Word 97.

Another scenario: Users run productivity apps—word processors, spreadsheets, and so on—on their local PCs, but use Terminal Server to access corporate HR or client databases from the central server. At R. R. Donnelly & Sons in Chicago, for example, some 500 users access a PeopleSoft financial application from a central server as part of a Windows terminal pilot program. By the year 2000, says Senior Systems Engineer John Maxwell, that number may exceed 3000 users at 52 locations running the application off 20 quad-processor servers.



THE WYSE WINTERM packs a thin client into a 14-inch monitor.



KEYBOARD? Not exactly: The Key Tronic ClienTerm 1000 has a thin client built in.

END OF THE PC LINE?

SO WILL your IS department switch your trusty Pentium II PC for a $600 Windows terminal? Not likely. For one thing, IS would find itself going chin to chin with a mob of angry users who are perfectly happy with their PCs.

What's more, Microsoft has priced Terminal Server so that it won't cut into sales of Windows 98 and NT 4.0 Workstation and Server. Terminal Server is $1129 a pop—the same as NT 4.0 Server. But each client requires a $269 Windows NT Workstation 4.0 license and a Windows NT Server 4.0 File and Print Client Access License for $40. And if your business plans to access Terminal Server from its PCs, it'll have to add in the $90 or so it paid for each copy of Windows 95 or 98. With the thin clients themselves priced at as much as $1000, using Terminal Server is clearly no steal.

Thin-client advocates point out that, though these terminals may cost as much as low-end PCs, they're less expensive to maintain. Centrally managed applications and devices take much less time to handle than thousands of individual PCs. In addition, terminals lack breakdown-prone moving parts and use fewer potentially incompatible hardware drivers than PCs. Finally, the absence of disk drives eliminates viruses and unauthorized program installations.

Our advice? If IS tries to deploy Terminal Server in your office, stay calm. In many cases, you'll keep your PC and use Terminal Server just to access centrally managed applications. If you're being moved to a Windows terminal, ask what applications and capabilities your server will provide. If your current Microsoft Office apps and other resources are supported, the change may give you a more reliable and responsive system. Then again, it may cut you off from tools and customizable capabilities you value highly. But set aside time for a heart-to-heart talk with your IS manager before you hit the panic button.

—*Michael Desmond* ■

PHOTOGRAPHS: KEVIN CANDLAND

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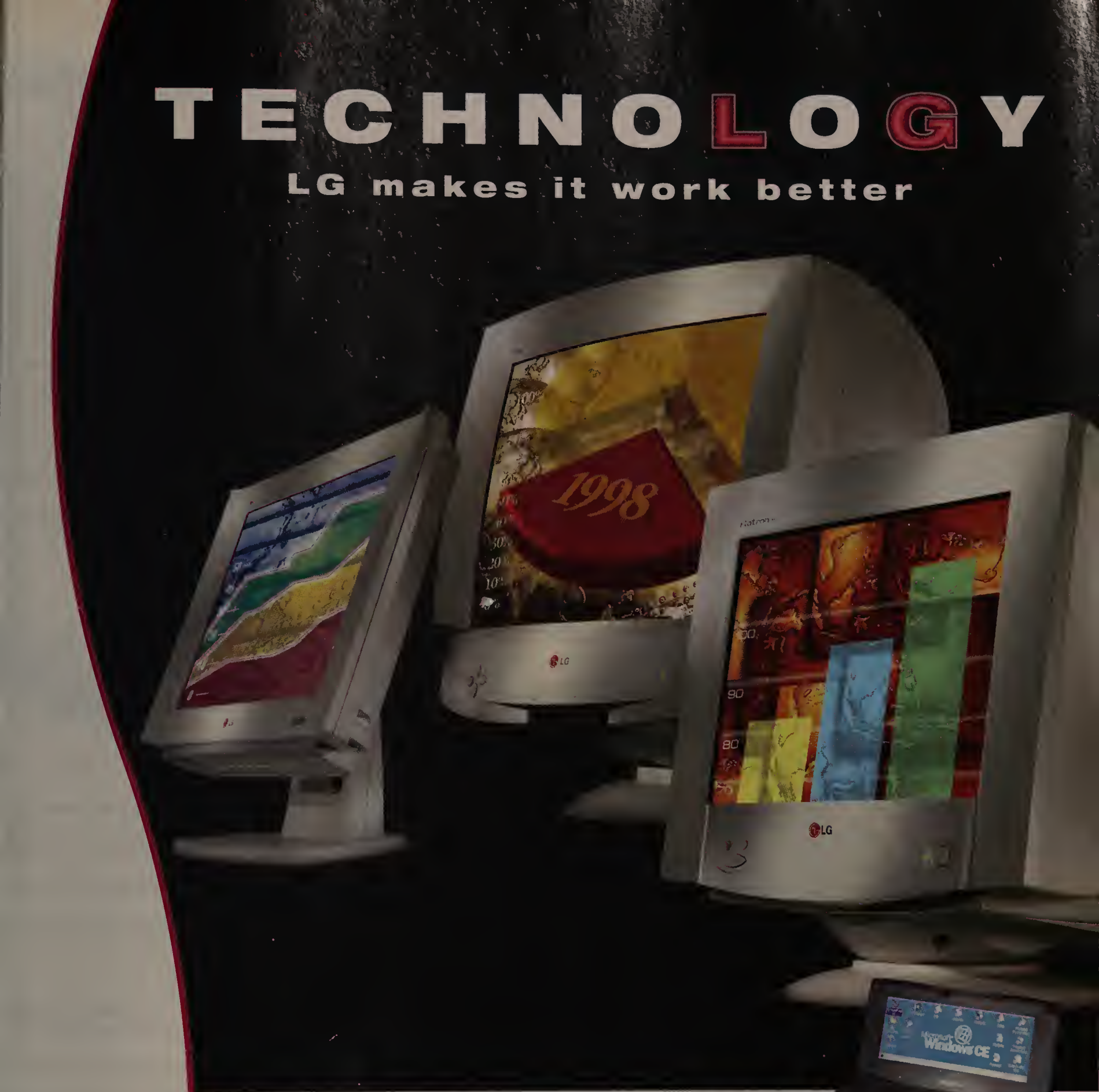

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Digital Photography Asserts Its Unique Value

POINT CLICK PRODUCE!

AS RECENTLY AS TWO YEARS AGO, most casual and semi-professional photographers viewed digital cameras as an exciting but not quite ready for prime time technology. With the introduction of advanced electronics that automatically adjust for range and lighting conditions, increased storage capacity, and image resolutions as high as 1.9 megapixels, you can just aim and shoot. Thanks to progressive advances in memory, storage, and imaging technology, consumers can choose to ignore the technology behind the shutter and benefit from the convenience and instant feedback of digital cameras.

Ricoh's RDC-4300 is a 1.3 million pixel camera offering resolution that goes up to 1280 x 960 (SXGA) and an array of advanced features.

"The biggest attraction digital camera technology offers consumers is ease of use and instant gratification," says Kevin Kane, a research analyst with IDC, a market research firm in Framingham, Mass. "The cameras let them communicate good quality images to their business associates, friends, and family just minutes after they leave the golf course," he quips.

Today's digital cameras deliver more value, quality, and features than ever before. Current models have transcended the cost/feature barrier and many capture images at resolutions that exceed a megapixel (one million pixel) resolution. What's that mean to you? It means you can purchase a digital camera that will take razor sharp, richly saturated color pictures of your family, your house, or your products for less than $700.

BUYERS IN ABUNDANCE

Figures from the Boston-based research firm InfoTrends indicate that shipments of digital cameras will soar from less than 1 million units in 1997 to 4.3 million units shipped in 2002. Beyond 2002, InfoTrends predicts a 43% growth rate per year.

What kind of a consumer buys those cameras, and for what use?

Digital cameras, once appreciated by only the tech set, now count both business and casual users among their biggest boosters. "About one-half of digital cameras are used in the home or in a home office, the other half in larger businesses," says InfoTrends' analyst Michelle Lampmann.

DIGITAL CAMERAS, ONCE APPRECIATED BY ONLY THE TECH SET, NOW COUNT BOTH BUSINESS AND CASUAL USERS AMONG THEIR BIGGEST BOOSTERS.

While they still can't quite match the quality of film cameras, digital cameras' low cost of ownership and ease of use make them a valuable addition to your collection of photographic equipment. And, if you transfer your images onto a CD or hard drive, as many people do, it's certainly time to take advantage of digital technology's file transfer convenience.

Lexar Media's removable memory cards come in capacities up to 64 Mb.

If you plan to use the photographs in your business, you need a higher-resolution camera so the images reproduce clearly in print and on your Web site; for example, the coat-pocket-sized RDC-4300 from Ricoh's Consumer Products Group in Sparks, Nev. A 1.3 million pixel camera, it offers resolutions ranging from 640 x 480 pixels (VGA) to 1024 x 768 pixels (XGA) up to a super-sharp 1280 x 960 pixels (SXGA). With its suggested list price of less than $600, the camera offers an array of advanced features such as a rotating 180 degree lens for maximum flexibility in framing your shots, and synchronized audio to capture not only the sights but the sounds of the moment. Typical of cameras in this price range, the Ricoh offers a zoom lens for both close-ups and enlarging distant subjects and removable memory cards so you never run out of storage while on-site. An LCD displays your pictures immediately after you take them so you can delete and retake the shots that are less than perfect.

The Agfa ePhoto 1680 features 1600 x 1200 resolution for under $1,000.

Once you have seen the near-film quality of images that cameras such as the sub $1,000 Agfa ePhoto 1680 from the Agfa Division of the Bayer Corp., Ridgefield Park, N.J., produce, you can opt to replace your 35 millimeter camera. The 1680 delivers an astounding 1600 x 1200 (1.9 megapixels) resolution and attains the threshold where a digital image begins to rival the quality of silver halide film. Other professional quality features of the camera include a 2-inch LCD screen that provides an immediate preview and a rotating 3x zoom to help you capture distant and hard to frame snapshots.

With Agfa's and Ricoh's digital cameras beginning to eliminate the quality gap with film cameras, one hurdle yet remains— digital cameras' need for a computer. From the clever minds at Minolta Corp., Rahway, N.J., comes the new 1.5 megapixel Dimage EX ZOOM 1500 that can eliminate the need for a com-

▶CONTINUED ON P.10

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New Technologies Doubling Photographers' Exposure

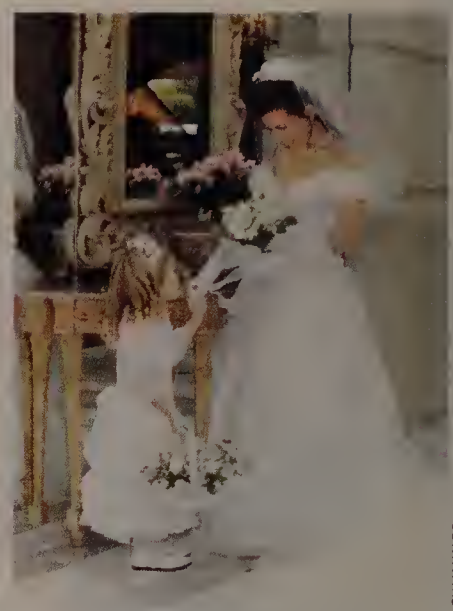
CUMMINGS

Veteran photographer Robert Cummings used digital imaging to expand his business. Cummings' work is at www.robertcummings.com.

Since the days when our Paleolithic ancestors lit the first fire and created new career opportunities from fireman to water carrier to cook, new inventions have ignited a creative streak in all of us. With the recent explosion in digital imaging, photographers and artists have sought and found new ways to turn the technology into a profit-producing opportunity. Although the three artists we profile here used traditional methods to achieve success, such as making it easier for customers to find and order their products, they employed out-of-the-box thinking to hit on the right combination of convenience and accessibility.

Alexandria, Va.-based photographer Robert Cummings adopted digital imaging in his business three years ago to increase his product line and attract new business.

"For 30 years, the basis of my business is portraits and weddings. At first, the switch from film to digital made me crazy," quips Cummings, "but now I use digital cameras, scanners, and specialized software every day." With his expanded product line and imaging services, which include posting wedding proofs on the Web, CD photo albums, disk-based slide shows, screen savers, and videos, Cummings says digital photography and imaging service bring him tens of thousands of dollars in new business every year.



CUMMINGS

"Orders that come in over the Internet are 100 percent new business for me. For instance, I shot a wedding where the bride came from Ghana. Afterwards, I posted the proofs on my Internet site. The bride gave her family members in Ghana the password so they could view the proofs. I started receiving orders for enlargements and prints from people who would never have seen the proofs. This is a revenue stream that no traditional photographer has ever had before." And because digital proofs cost less than paper proofs, Cummings not only increased his business but decreased his expenses.

Finding ways to promote his new products to the public was one of Cummings' greatest challenges. "When we first put up the Web site, we just assumed that people would find us. We were dead wrong. Advertising made the difference. We experimented and eventually found how and where to publicize our Web site so that people would connect to us. Now that we know how to make ourselves visible, I get a hundred hits a day on my Web site."

Cummings adds that he uses both digital images and film cameras. "For the highest quality resolution, film is still best. But for speed, convenience, and flexibility, digital cameras and digital images are definitely the way to go."

WEAVING NEW DESIGNS

Olivier Massot, the textile designer whose work can be seen on display in New York's Guggenheim Museum and is used in Geoffrey Beene's haute couture clothing collections, says that digital imaging has turned him from a traditional artist into an inventor of new designing processes.

"Digital cameras have allowed me to build a partnership between art and technology. I can now achieve things that I could only dream of before," says Massot, who maintains a studio in Brooklyn, N.Y.

Massot's transition began several years ago when the aspiring twenty-something artist found himself

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with so many of his designs in use by so many people that he was in danger of losing track of his work. "At first, I simply wanted a way to archive what I had done. Being comfortable with both cameras and computers, I purchased an inexpensive digital camera to copy all of my designs into my PC."

As soon as the designs were digitized and cataloged, Massot foresaw new possibilities, such as altering and adapting the images. "The camera opens new doors between myself and my art," Massot effuses. "It's a process. Digital imaging empowers me to do exciting things like create a dozen variations of a single design— each one unique. I can now create collages out of my designs. I can change the original design in ways that would have been practically impossible to do manually."

The artist also found it easier to sell his designs. "For a presentation, I could load my portfolio from the computer to a digital camera. I would plug the camera into the client's TV input and there was my work, in living color. People loved it!"

As a result of a collaboration with digital camera maker Casio Corp., Dover, N.J., Massot began creating ever more dramatic and unique fabric designs. "Thanks to these new digital tools, I see new creative possibilities in my life."

"DIGITAL CAMERAS HAVE ALLOWED ME TO BUILD A PARTNERSHIP BETWEEN ART AND TECHNOLOGY." – Olivier Massot

Massot has some advice to offer to visual artists and photographers entering the digital world. "Don't get caught up in the resolution war. Buy the tools you can afford and then experiment. You can do fine work at 480 x 640 resolution. Use the computer to enlarge or compress the images and to make collages of your images. Artists often do their best work when they push the limits of the tools they have and change the ordinary into the extraordinary."

©1998 OLIVIER MASSOT

A collaboration with Casio opened up new creative possibilities for textile designer Olivier Massot. His work is at www.casio.com/cgi/cfeatures8.cgi.

GIBBONS

PORTRAITS ON THE WEB

Digital imaging has also helped alter the business of Rodney Gibbons, veteran photographer from the nation's capital area. Several years ago, Gibbons noticed that the growing adoption of digital scanners and copiers were reducing his business.

"I saw customers making scans of our paper preview photos; our reprint sales dropped to nearly half of previous levels. Instead of fighting the trend, I looked for ways that we could use this new technology," says Gibbons.

The Winchester, Va.-based photographer soon saw a new way to present images to customers. "After a shoot, we put the best images on a Web page, a CD, or a video tape. The clients would look over the photos and then select the ones they wanted. Our customers loved the new technology, and we wound up saving hundreds of dollars in proof printing costs on every shoot. The quality of the digital copies were good enough to view but (purposefully) not good enough for prints, which means that our print and reprint sales climbed back up."

Gibbons still does much of his top-end portrait work with film-based cameras but uses digital imaging techniques to retouch photographs.

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Rodney Gibbons finds digital imaging is a good tool for retouching and restoring photographs. Gibbons' work can be found at www.creativefoto.com.

"There's no longer any need to shoot in flat light and soft focus to hide wrinkles and blemishes. We shoot in 35 millimeter, using good portrait light, and we get beautifully detailed photos without that washed out look of traditional glamour work. After developing, I show the proofs to my corporate clients. Sometimes they ask me to remove wrinkles from their faces or even excess skin from under their arms. By the next morning, I have them looking trimmer and five to 10 years younger."

Gibbons also found that digital imaging made it possible to perform minor miracles in photo restoration. "We can rescue just about any photo a customer brings in, even if it's torn or a piece is missing. We can change color or background. We can make copies of copies of copies without losing detail." And if life could only imitate art — "We can even add or remove people from a group."

What would make this photographer's professional life better? "We wish we could go digital from shoot to print, saving hours of scanning time. But professional digital cameras still cost $20,000 or more. When they come down in price," says Gibbons, " you can be sure we will be there."

Sony Gives the HiFD the High Five

Despite all the advances made in computer hardware, the venerable 3.5-inch diskette has successfully resisted change. But now, with the advent of ever-larger file sizes, they just don't measure up anymore. Snapshooters will especially feel the squeeze when they store or exchange image files.

Analysts say that media vendors will sell more than four billion 1.44 Mb diskettes this year. If those diskettes held more data, perhaps people would not have to buy so many of them.

Sony's HiFD disk storage technology boosts storage capacity by up to 100%.

One disk storage technology that could succeed in replacing the anemic diskette drive comes from Sony's CCPG Division, San Jose, Calif. Dubbed the HiFD, it uses 200 Mb diskettes, giving it a storage capacity 60% to 100% greater than competitive extended storage drives. As an added bonus, the HiFD reads and writes 1.44 Mb and 720K diskettes, a boon for people who have closets full of 3.5-inch diskettes they want to keep on using. And because the HiFD uses removable media, you can remove one diskette and substitute another so you will never run out of storage.

Performance too, gets a boost. Spinning at 3,600 rpm (compared to the languid 300 rpm of the 3.5-inch floppy) this next-generation diskette drive transfers data at a brisk 3.6 Mbps— about six times faster than its venerable predecessor.

How do you decide what extended storage drive to buy? Wolfgang Schlichping, research manager of removable storage devices at IDC in Framingham, Mass., offers this advice. "When it comes to choosing the kind of extended storage device you want, the choice comes down to maintaining compatibility with your other data storage. That is what is most important," he says.

So when it's time to upgrade, remember that it was Sony's 3.5-inch diskette that antiquated 5.25-inch disks. Will history repeat itself?

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◀CONTINUED FROM P.2

puter. The camera uses its 16 Mb of RAM to display in-camera tutorials (viewable on its 2-inch LCD), edit, and manage images. A new, open operating system enables the 1500 to print on photo quality printers from a wide variety of vendors. The 11-ounce, sub-$1,000 camera offers a 3.5 frame-per-second burst capture mode for capturing action shots.

If your subjects tend to consist more of scenics or casual photos of family and vacations, you can capture the moment for as little as $250 to $450. That buys you a camera with 640 x 480 (VGA) resolution, fixed lens, plus basic image editing software for your PC. If you don't take close-ups and don't need to print your photos larger than 4 x 6 inches, cameras with these features are a good choice for you.

SHIPMENTS OF DIGITAL CAMERAS WILL SOAR FROM LESS THAN 1 MILLION UNITS IN 1997 TO 4.3 MILLION UNITS IN 2002. – InfoTrends

MEMORY FOR YOUR MEMORIES

You might want to capture all your snapshots in high resolution. Unfortunately, hi-res images gobble up storage so there's a price to pay — for additional memory to store those images.

One marketer of affordable removable memory, Fremont, Calif.-based Lexar Media, Inc., offers a variety of cards that conform to the CompactFlash and SmartMedia standards. Available in capacities up to 64 Mb, each matchbook-cover-sized "digital film" card can hold dozens of high-resolution images. If you need more capacity, you simply eject the filled card and insert a new empty one. Lexar's high-performance cards record data at a sustained 750 Kbytes per second, which makes them particularly appealing to photographers who snap consecutive action shots and cannot tolerate write-to-memory delays.

Ixla's Digital Camera Suite features editing and image transformation tools.

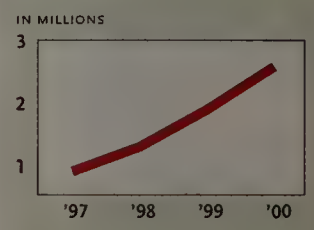
For digital photographers, a color printer is almost *de riguer*. While the prices of color laser or dye sublimation printers continue to hover around $3,000, today's photorealistic inkjet printers produce bright images with saturated colors. Averaging a modest $300, color inkjets can produce an 8 x 10-inch print at 1,440 dpi. Printed on special glossy paper, the images look like they came from the corner drugstore.

A TUCK HERE, A TUCK THERE

In real life people may not be truly perfect, but as subjects in your photos, they can be. The final component in your desktop digital darkroom is the software that will enable you to manipulate and manage your photos. For best results consider purchasing an integrated suite that includes a variety of editing and image transformation tools. One such collection, the Digital Camera Suite from Ixla, Ltd., Danbury, Conn., flattens the learning curve and accelerates your productivity since all of its utilities share a common interface and command set.

Ixla's comprehensive suite of utilities includes Photo Publisher, a collection of Wizards to create and print brochures, greeting cards, photo albums, and invitations. Enhance your images with the suite's 50,000 pieces of clipart and turn your photos into a hosted or self-running presentation. E-image printing tools enable you to create images that enliven your Web pages and print electronic postcards.

DIGITAL CAMERA SHIPMENTS



$ VALUE OF DIGITAL CAMERA SHIPMENTS

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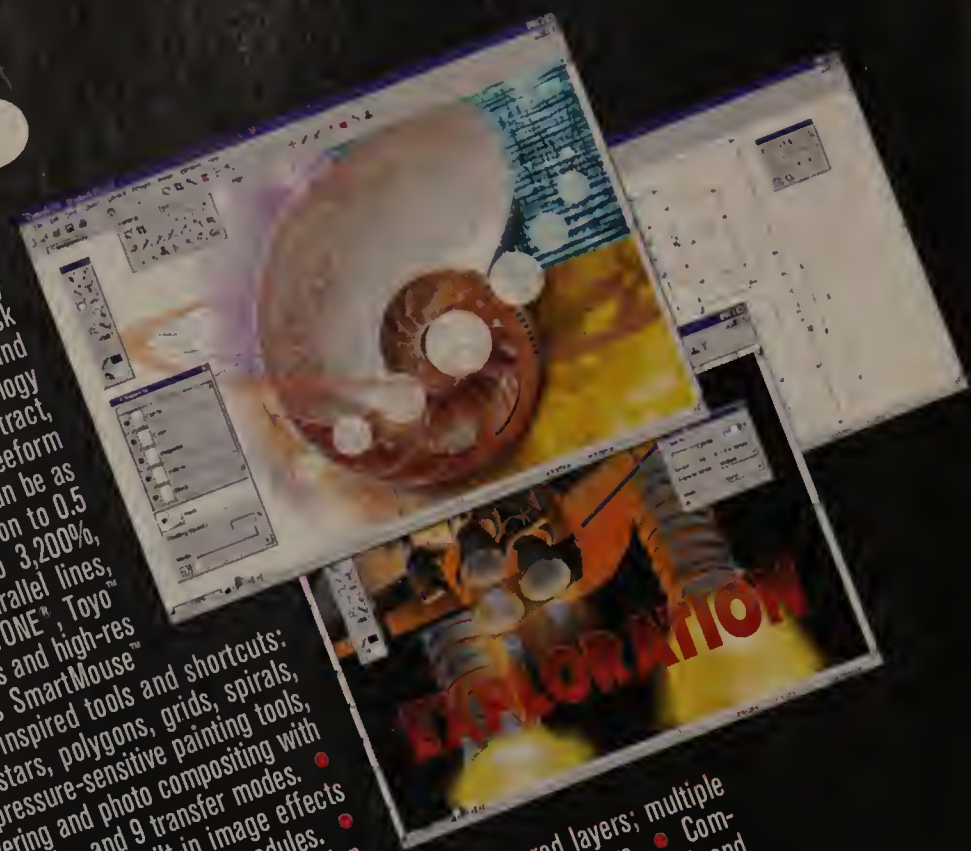

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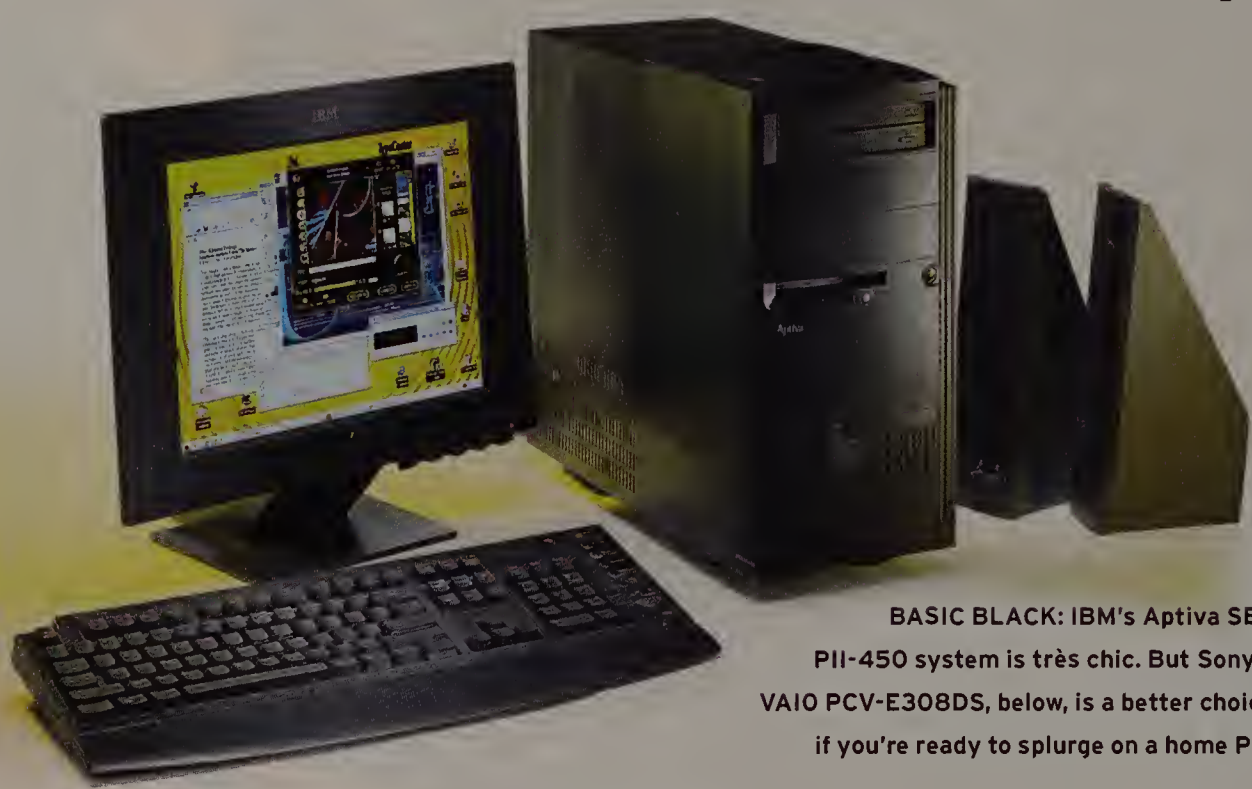
NEW PRODUCTS

Desktop Couture: High-Style Home PCs From IBM and Sony



BASIC BLACK: IBM's Aptiva SE7 PII-450 system is très chic. But Sony's VAIO PCV-E308DS, below, is a better choice if you're ready to splurge on a home PC.

PHOTOGRAPHS: MARC SIMON

DESKTOPS

IT'S THE HOLIDAY season—time for tinsel, glitz, glitter, and PCs that would never, ever be caught in a discount store. If you want an extravagant home PC that will make the neighbors ooh and aah, IBM's $3498 **Aptiva SE7** and Sony's $2899 **VAIO PCV-E308DS** have the look. They're as far removed from beige boxes as you can get. But since the average Pentium II-450 desktop costs about $2585, you'll pay a pretty penny to acquire the high style. We tested preproduction versions of both machines, with 128MB of RAM.

IBM's Aptiva SE7, with its matte black case and flat-panel display, appears fit for a home office on Park Avenue. Its ritzy configuration includes a huge 16.8GB hard drive, a customizable keyboard that provides instant access to your favorite programs, and sleek, ultramodern speakers that deliver top-flight sound.

But look closely, and you'll find that the SE7 has more style than substance. One reason this system is so expensive is its 15-inch flat-panel display, which gives you about the same screen terrain as a typical 17-inch CRT monitor. Unfortunately, none of us who saw it were impressed. The text on the flat-panel display looked fuzzy and the color seemed almost murky. The SE7 also comes with an outdated graphics chip—an integrated ATI Rage Pro Turbo AGP 2X, which isn't optimized for playing games.

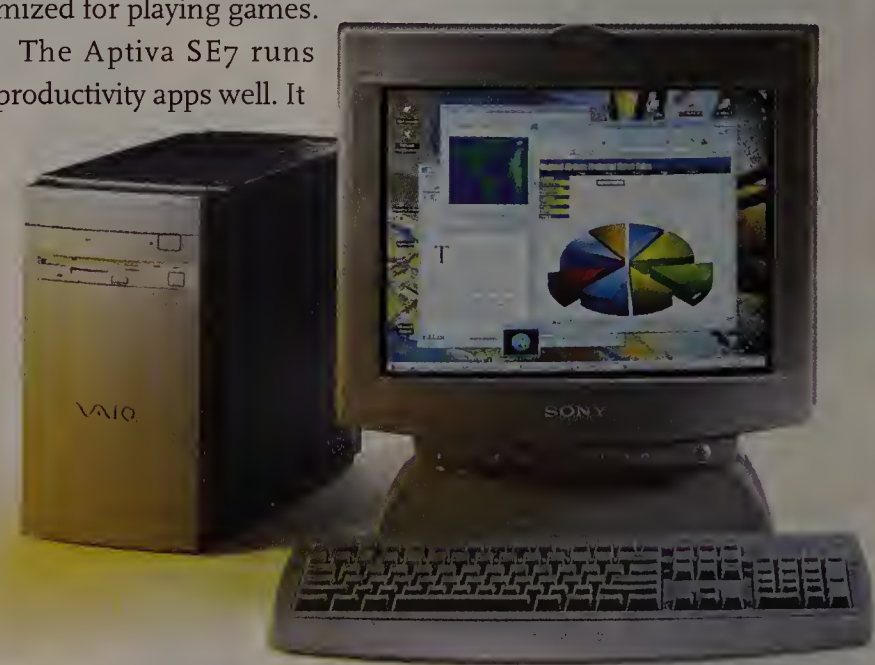
The Aptiva SE7 runs productivity apps well. It earned a PC WorldBench 98 score of 210, close to the 215 average for its processor class.

Although we appreciate the SE7's visual appeal, a system this expensive should be first-class all the way.

TONY SONY

WITH A TWO-TONE lavender-and-gray case, the Sony VAIO PCV-E308DS lacks the IBM system's futuristic look, but it's no nerdy prisoner of the eighties either. More important, it's loaded. For starters, this system has an IEEE 1394 FireWire port, the up-and-coming technology that promises easier setup of peripherals and more speed than USB. (Sony's marketing term for the IEEE 1394 port is the I.Link.)

The Sony system also packs in two USB ports, a 13.6GB hard drive, a 5X DVD-ROM drive, a top-tier Matrox Millennium G200 graphics card that's great for games, and a 56-kbps modem. The sharp



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IBM Aptiva SE7

PRO: Sleek, matte black case; 16.8GB hard drive.

CON: Second-rate graphics power, disappointing flat-panel display.

VALUE: Oh-so-stylish, but not a good investment.

Street price: $3498, with 15-inch flat-panel display

IBM

800/426-7235 ext. 4340

www.pc.ibm.com/us/aptiva

Sony VAIO PCV-E308DS

PRO: Loaded with goodies, including an IEEE 1394 FireWire port.

CON: Speakers could be better, poorly designed for upgrading.

VALUE: A splurge, but you'll enjoy it.

Street price: $2899

Sony Electronics

800/315-7669

www.sony.com/pc

INFONET NO. 749

TEST PC WORLD CENTER THESE PRODUCTS have been evaluated using tests designed by the PC World Test Center.

17-inch monitor has speakers built into its base. Sony boasts that you can edit video with this system, too, by connecting Sony's digital video camera to the PC's IEEE 1394 port.

Should you plunk down $2899 for this machine? It's not perfect. The speakers were okay, but a discerning ear would demand more clarity. And though you probably won't be upgrading this loaded PC anytime soon, flexibility eventually becomes an issue. The VAIO's power supply blocks access to almost all of the motherboard. Finally, while this machine isn't a slowpoke, it's no racehorse either. Its PC WorldBench 98 score of 201 is about 7 percent slower than the average PII-450 system's.

The judgment from this side of the runway? Many people will find either system's price extreme. But if you want something extravagant, the Sony is the better choice for your holiday wish list.

—*JoAnne Robb*

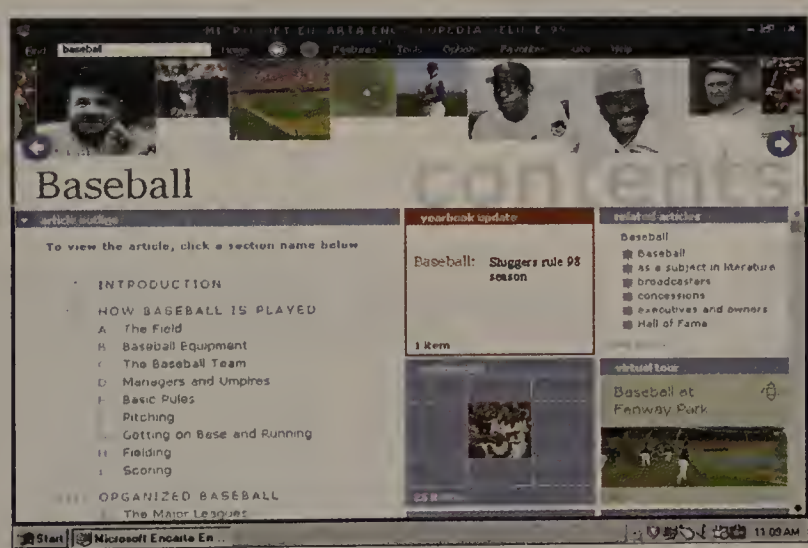
Microsoft Encarta on DVD-ROM: A Home Run

ENCYCLOPEDIA

WITH MULTIMEDIA encyclopedias, information that once filled dozens of volumes now fits on several CD-ROMs—or in the case of Microsoft's **Encarta Reference Suite 99,** on one DVD-ROM.

Street-priced at $139, Encarta 99 is the only multimedia encyclopedia currently available on DVD-ROM. It also comes in a five–CD-ROM edition for $100 (see "Top 10 Titles of 1998," page 245).

After reviewing beta copies of both editions, I think the advantage of having all resources on one DVD-ROM cannot be overstated. Along with Encarta encyclopedia, Microsoft packs in Virtual Globe 99 (maps and atlas), Bookshelf 99 (dictionary, thesaurus, quotes, and such), plus research and homework wizards. At 4GB, this DVD-ROM is bigger than my hard drive. Sheesh. (Encarta 99 demands a whopping 195MB of hard drive space for a full installation.)



DYNAMITE ON DVD-ROM: Microsoft's $139 Encarta Reference Suite 99 offers impressive multimedia content and an enhanced interface.

The DVD-ROM edition does more than save on discs: Its multimedia features work markedly better than do those on the CD-ROM edition. Video clips are larger and sharper, and audio clips sound better. The DVD-ROM edition offers many more videos and 360-degree virtual tours of famous locales (such as San Francisco's Chinatown).

Encarta 99 (on either media) boasts a vastly improved interface, with a browserlike approach to navigating forward and backward through documents. Microsoft has built in a few voice-control options for basic commands; I found this feature more cool than useful.

online FOR MORE PRODUCT news and the latest announcements, check out the PC World Daily News Service at www.pcworld.com/news.

If you have a DVD-ROM drive, Encarta 99 is a must-have. But even on CD-ROM, it beats the competition—namely, IBM's World Book Family Reference Suite 1999 and the 1999 Grolier Multimedia Encyclopedia—in the breadth of its content and the convenience of its interface.

—*Glenn McDonald* ▶

Encarta Reference Suite 99

PRO: DVD-ROM edition is convenient; packed with multimedia.

CON: Hard drive hog.

VALUE: Go for it.

Street price: DVD-ROM $139; CD-ROM $100

Microsoft

800/426-9400

www.encarta.msn.com

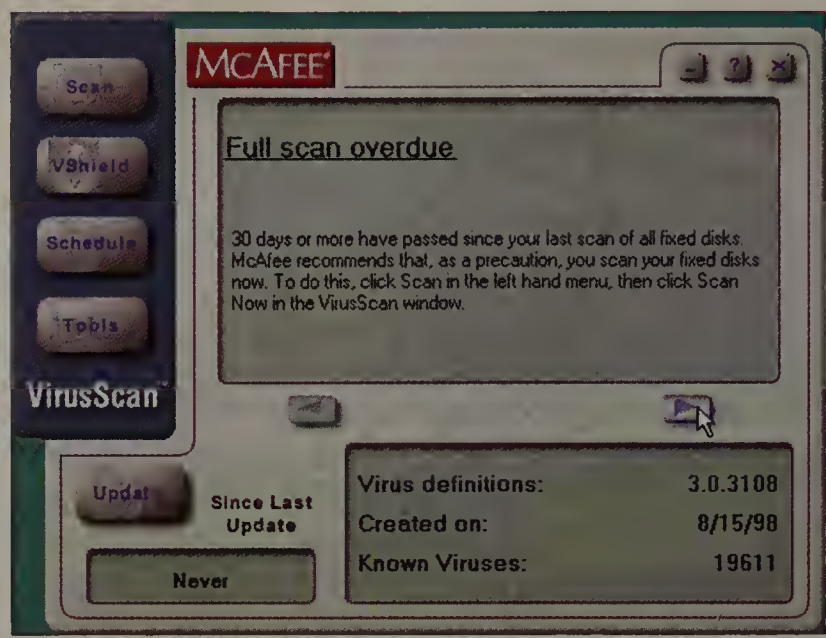
INFONET NO. 750

Someone to Watch Your PC: VirusScan 4.0

ANTIVIRUS

MAYBE YOU'RE SICK of playing antivirus tag. Network Associates and Symantec, makers of McAfee and Norton (the two best antivirus utilities), keep releasing new versions one after the other, each containing small refinements. But **McAfee VirusScan 4.0** introduces a better interface and clever new features.

While previous versions of McAfee VirusScan scored high in effectiveness, their plain-vanilla look and feel often made performing typical chores and customizing settings unduly arduous. That's changed considerably in version 4.0, based on the preproduction copy I tested.



PRETTY AND SMART: McAfee VirusScan 4.0 shows a much improved interface. The application prompts you when it's time for a full scan.

McAfee VirusScan Central, the integrated control panel, gives you handy access to the program's main tools as well as to hints and tips. It suggests when virus signature files need updating and when the PC needs a full system scan. Automatic, free updates of virus signature files via the Internet are one click away. And these updates are unlimited. (Norton recently restricted the duration of its free updates to one year from purchase.)

VirusScan 4.0 now protects against malicious Web-site–based ActiveX and Java applets. You can even lock out specific Web sites.

The program also actively scans e-mail attachments and downloaded files for viruses. If you feel bewildered by all these choices, a wizard can lead you step by step through setup of the basic options.

So, who's "it" for now? If you're a Norton AntiVirus user, there's really no compelling reason to switch. But if you're in the market for your first antivirus utility, or you already run an earlier incarnation of McAfee VirusScan, get inoculated with version 4.0.

—Stan Miastkowski

McAfee VirusScan 4.0

PRO: Much improved interface, effective virus protection.

CON: Nothing major.

VALUE: Currently holds a slight edge over Norton AntiVirus.

Street price: $50

Network Associates

408/988-3832

www.mcafee.com

INFONET NO. 751

LapLink Professional: Communications Star

COMMUNICATIONS

LAPLINK IS THE Michael Jordan of remote control software packages. In terms of strength and resourcefulness, it's hard to beat this veteran communications program. The newest version, **LapLink Professional,** offers such useful improvements as remote printing and USB support.

LapLink has always let you transfer files between two PCs or use a local system to control a PC elsewhere. LapLink Professional's taskbar-style control bar makes choosing a connection between two PCs easy. You simply click the Connect Over icon and choose direct-dial, Internet, or LAN connection via TCP/IP. Or you can select a parallel, USB, or serial cable connection.

This new version introduces a print redirection feature that lets you print directly from the remote PC to your local printer, and vice versa. The program now includes USB support for Windows 98 systems, which can speed up file transfers prodigiously. (A USB cable is available for $39.)

For the first time, LapLink supports every variety of Windows in one box. (Registered users can even download a free upgrade for Windows CE 2.0 from www.travsoft.com.) With my preproduction copy, I controlled my NT desktop remotely from a Windows 95 laptop (and vice versa), over the phone, and over a serial cable; however, LapLink does not support parallel-cable operation under NT.

LapLink proved superior to the Direct Cable Connect facility in Windows 95 and 98. Linking two PCs took about 5 seconds over the parallel or serial port—versus 30 seconds with DCC; transfer times were roughly equal. LapLink includes a serial cable, but for sharing files between local PCs, you'll want a parallel or USB cable.

If you spend time on the road or juggle two PCs in the office, LapLink Professional is a most valuable player.

—Michael Desmond ▶

LapLink Professional

PRO: Easy installation and setup, supports all Windows versions.

CON: Even the best remote control programs aren't superfast.

VALUE: Best of its kind for travelers and work-from-home types.

Street price: $149, upgrade and competitive upgrade $69

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INFONET NO. 752

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AGP Graphics	•	•	•	•	•
RAM	128 MB	128 MB	128 MB	128 MB	128 MB
Modem	56 k	56 k	56 k	56 k	56 k
Hard Drive	8 GB	6.4 GB	8 GB	8.1 GB	6 GB
DVD-ROM Drive	•	•	•	•	•
LS-120 SuperDisk™ Drive	•			•	•
All Drives Built-In		•			•
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Pointing Stick	•		•	•	•
Price	$6149	$3696	$4937	$5601	$3199

*Chart information based on 10/9/98 audit of www.dell.com, www.microwarehouse.com, www.cdw.com, www.technologydirect.com, www.compactdirectplus.com, and www.compusadirect.com.

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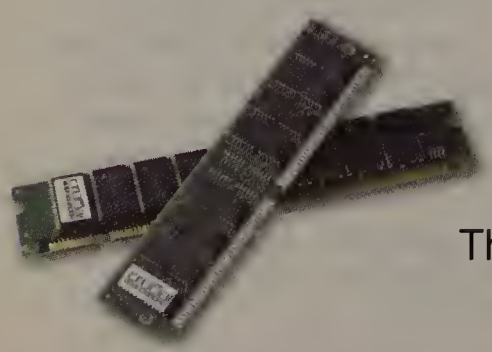

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Series	$241.98	$119.98	$59.99
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233 Best Buy and G6-233 Home Essentials	$241.98	$119.98	$59.99
66 G6-233	$241.98	$119.98	$59.99
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Millennia Transport P120, P133, P150	N/A	N/A	$99.98
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HP	128MB Upgrades	64MB Upgrades	32MB Upgrades
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erJet 4000, 5000, 8000 Series	N/A	$179.98	$89.99
erJet 5P	N/A	N/A	$59.98
ion 3100 Series	N/A	$119.98	$59.99
ion 5030, 5040, 5120	$219.96	$109.98	$59.98
ion 7050, 7055, 7070, 7090	$219.96	$109.98	$59.98
ion 7110Z, 7120, 7125	$219.96	$109.98	$59.98
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Aptiva (2168), Model A40, A90, A92	$219.96	$109.98	$59.98
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ThinkPad 365X, 365XD	N/A	N/A	$99.99
ThinkPad 380, 385	N/A	N/A	$99.99
ThinkPad 560	N/A	$219.99	$99.99

Apple	128MB Upgrades	64MB Upgrades	32MB Upgrades
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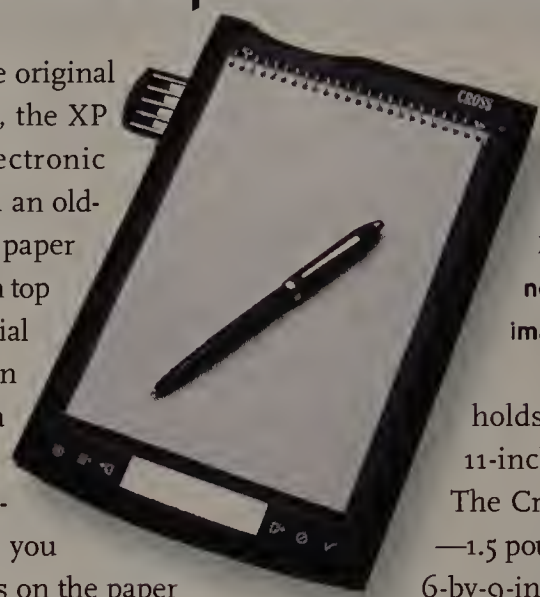
CrossPad XP: Smart but Expensive Notepad

GADGET

"PAPER IS MY enemy," a friend recently told me. Maybe you know what she means. You take notes constantly, the paper stacks up—and you never use half the information. To get organized, you could try a PDA. Or you might consider Cross Pen Computing's **CrossPad XP**. A smaller, lighter version of the original CrossPad, the XP is an electronic tablet with an old-fashioned paper notepad on top and a special Cross pen that has a built-in radio transmitter. As you write notes on the paper pad, the pen transmits your jottings to the tablet, which saves them (up to 160 pages) as image files in its 1MB of memory. You then upload the files to your PC via serial cable. It's a useful tool, but at $399, a bit overpriced.



PAPER PLUS: The new CrossPad XP saves notes as image files.

The original $399 CrossPad weighs 2.2 pounds, and it holds an 8.5-by-11-inch notepad. The CrossPad XP—1.5 pounds with a 6-by-9-inch pad—is much smaller and fits into the smallest briefcase. Like Cross pens, the sleek, black CrossPad XP seems attuned to corner-office aesthetics. The XP also has some sensible ergonomic improvements, particularly the integrated pen holder.

Although notes aren't saved as editable text, bundled IBM Ink Manager 1.5 software does let you search the files on your PC by keyword, which you indicate by circling notations on the pad. You can review notes inside Ink Manager, or cut and paste them into e-mail messages or Word documents.

The unit does include software for converting handwriting into text. But in my tests of a preproduction version, the software worked well only when I wrote very neatly.

The CrossPad XP's biggest drawback is its price. It costs more than 3Com's pocket-size Palm III PDA, which, in addition to storing stylus-written notes, can synchronize contacts, schedules, memos, and to-do lists with your desktop PC. Paper may be your enemy, but the CrossPad XP makes you pay a high price for peace.

—Laurianne McLaughlin

CrossPad XP

PRO: Sleek 1.5-pound tablet saves handwritten notes as image files for transfer to and editing on a PC.

CON: Expensive.

VALUE: Useful, but costly.

Street price: $399

Cross Pen Computing Group

800/510-9660

www.cross-pcg.com

INFONET NO. 712

JVC's $99 E-Mail Gizmo Doesn't Fly

GADGET

DON'T WANT TO buy a laptop PC or a PDA just to retrieve e-mail while you're out of the office? PocketMail, a new, $10-per-month service, will download your in-box e-mail to small, PDA-like devices. I tested one of the first products to use the service, JVC's $99 **HC-E100 Portable E-Mail Device**, but I found the keyboard to be frustrating.

The PocketMail service is easy to use. Just dial a toll-free number from any telephone, hold the JVC device up to the earpiece, and the unit's built-in acoustic-coupling modem connects to PocketMail's server. While previous acoustic modems were notoriously slow, this one works quickly: It takes only 3 to 5 seconds to send or receive a message. PocketMail's error-correcting code cancels out background noise so well, I was able to dispatch e-mail from a pay phone in a raucous Irish pub.

You get a PocketMail.com e-mail address when you first sign up, but the JVC device can check mail from any POP3 Internet mail account. In addition, a built-in address book can store phone, fax, and e-mail addresses.

You can't send or receive any file attachments, however, and messages can't exceed 4000 characters. Once the JVC unit's 128KB of RAM reaches capacity, you'll have to delete messages—though you can archive them to your desktop PC from the server.

Now the really bad news: Composing a message on the HC-E100's mini-QWERTY keyboard is both painful and slow—like typing numbers on a cheap pocket calculator. If you tap more than 2 characters per second, many keystrokes will never appear on screen. Only a masochist would attempt to type anything close to the 4000-character maximum in a message.

Using common symbols or punctuation marks is particularly difficult. If the symbol is on top of a number key, you press <Shift>, but if it's above a letter key, you have to use an alternative shift key (marked <2nd>), which gets confusing.

The HC-E100 disappoints, but the software has potential. Stay tuned.

—Andrew Brandt ▶

JVC HC-E100 Portable E-Mail Device

PRO: Cheap gadget sends and receives basic e-mail.

CON: Device's keyboard is extremely difficult to use.

VALUE: Wait for a better PocketMail-enabled device to emerge.

Street price: $99

JVC

800/252-5722

www.jvc.com

INFONET NO. 713

PocketMail Service

Pricing: $10 per month

800/390-5034

www.pocketmail.com

INFONET NO. 714

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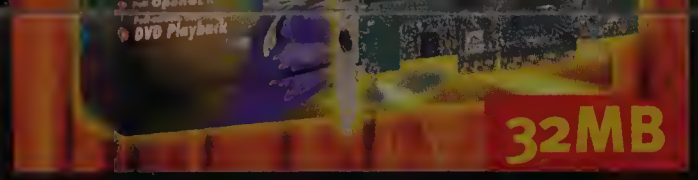

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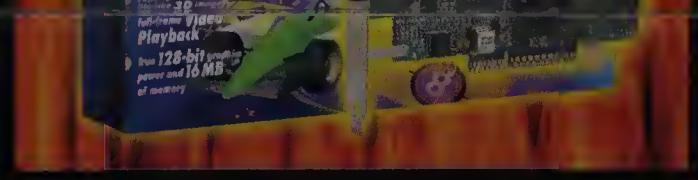

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- Advanced 3D features including line and edge anti-aliasing, double buffering, gouraud shading, multi-texturing and bilinear/trilinear filtering
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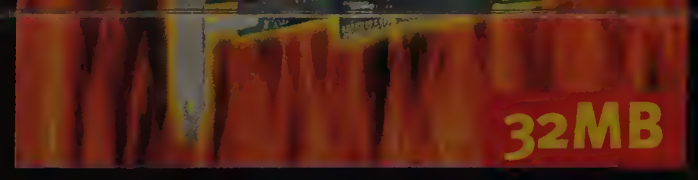

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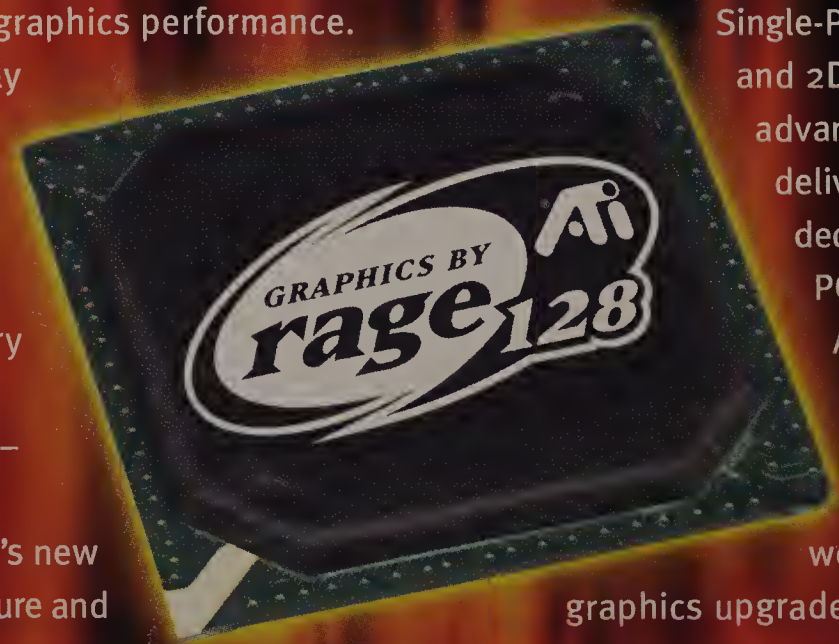

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Microsoft's Cordless Phone Has PC Punch

COMMUNICATIONS

UNTIL NOW, PC phone users faced a big problem: To make even a quick call, they had to first turn their PC on—or leave it on all the time. Microsoft's $200 **Cordless Phone System** includes a 900-MHz, 40-channel phone that can work without the PC. But with a PC, the system's powerful software adds slick call-management tools. I tested a shipping version.

When the PC is off, you can make and receive calls, and use the speed dial and loudspeaker functions. But for voice mail capability and customization power, attach the base station to the PC with its serial cable and turn the PC on. The included Microsoft Call Manager Software exploits the capabilities of Caller ID service (available from most local telephone companies for $6 to $10 per month). You can create personalized greetings for different callers and send some callers straight to voice mail. Address book records pop up on screen after the first ring; incoming messages are stored on your hard drive.

Call Manager's voice recognition technology lets you program the system to dial your mother's number when you say "Mom." Voice commands can be made via the handset, but you'll need your own mike to record outgoing messages.

Mastering the many functions activated from the PC or the receiver's 22 buttons takes time. Both the base station and the charging cradle have space-hogging brick wall plugs. You have to install Internet Explorer 4.01 because Call Manager uses its Outlook Express module. Finally, you need 30MB to 100MB of valuable hard disk space for the software and incoming messages.

Despite these drawbacks, the Microsoft Cordless Phone System can be quite useful for a home or small business.

—Michael S. Lasky

Microsoft Cordless Phone System

PRO: Flexible call management; PC doesn't need to be left on.

CON: Package hogs power outlets and hard disk space; learning to use it takes some time.

VALUE: A useful small or home business tool.

List price: $200

Microsoft

800/426-9400

www.microsoft.com

INFONET NO. 716

QUICK TAKES

Modem Protector

SNAP, CRACKLE, POP! You've rolled into your hotel, plugged your notebook's modem into the wall jack—and watched the modem fizzle because the phone line was incompatible. No e-mail, no connection to the company database, no surfing the Web. Modem surge protectors have long been a good investment for mobile users, but Road Warrior's $60 Modem Saver does even better. It tells you whether the line is safe to use before you plug in your modem. When I connected a shipping version of the product to a standard analog line, a green LED glowed. When I plugged it into a potentially damaging digital office line, it flashed a red warning light. Once you know that the line is safe, Modem Saver acts as a surge protector. Road Warrior Int'l, 800/274-4277; www.warrior.com

INFONET NO. 717

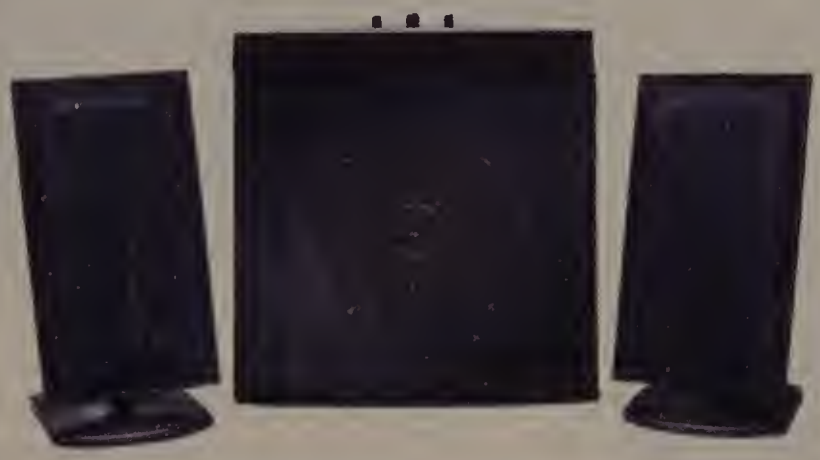
–Tracey Capen

Monsoon MM-1000 Speakers: Special Effects

SPEAKERS

SONIGISTIX's futurist-looking **Monsoon MM-1000** speakers are more than eye-catching: They use a sleek flat-panel design to produce impressive simulated 3D sound at a moderate list price of $229. These speakers will please business users who do multimedia presentations, but will delight gamers and music aficionados.

Unlike basic, cone-shaped speakers that spray sound to an entire room, the Monsoon MM-1000s deliver accurate, simulated 3D sound to a precise location, making them superior when you're seated in front of a PC monitor.



PUTTING NOISE IN ITS PLACE: The Monsoon MM-1000 speakers focus sound at your desk, with excellent results for 3D games.

The MM-1000 package includes two of the planar satellite speakers, each about the size of a paperback, along with a hefty subwoofer. In my tests with a shipping version, I played audio CDs and a 3D game—Wing Commander Prophecy. I found the sound from the Monsoons much superior to that produced by a comparably priced Boston Acoustic MicroMedia set.

The connectors on the back of the subwoofer could be positioned lower so the wires wouldn't show. But that's a small quibble. The Monsoons are the best speakers that I've seen at this price.

—Rex Farrance ▶

Monsoon MM-1000 speakers

PRO: Focus sound on user; excellent 3D sound effects.

CON: Wires behind speakers are exposed to view.

VALUE: Well worth the price for game and music aficionados.

List price: $229

Sonigistix

877/722-8346

www.monsoonpower.com

INFONET NO. 715

HomeSite 4.0: Modest Design Tool Upgrade

WEB PAGE DESIGN

WEB DESIGN packages fall into two categories: HTML editing apps that let Web professionals get up close and personal with code, and friendlier packages that let casual Web designers drag and drop images and text on their pages. With **HomeSite 4.0,** Allaire tries to satisfy both groups. After using a preproduction copy, I'd say pros will be pleased but casual users might be confused.

This inexpensive program ($89 as a download, $99 on CD-ROM) has long been a favorite of Web designers, because it dramatically increases the speed at which HTML files open and close. You can also save time by customizing keyboard shortcuts and toolbars for frequently used features.

Version 4.0's new WYSIWYG editing mode lets you generate pages in a word processor–style interface—especially helpful when you're facing a time crunch. But this editing mode requires Internet Explorer 4.01 or later. And frankly, if you want WYSIWYG design, you'll find better editors in Microsoft FrontPage Express (a free IE 4 add-on) or Netscape Composer (free with Netscape Communicator).

However, HomeSite still handles text expertly. Its extended search and replace features—for finding text anywhere on your Web site—are among the best. Its spelling checker ties into Microsoft Word's spelling engine, underlining potential errors in red so you can catch mistakes without running a spell check every time you make changes. Pop-up menus and toolbars offer HTML tags, obviating the need to retype them. And the program's tightly integrated code validator tells you what's wrong with your HTML and how to repair it.

These thoughtful features have kept HomeSite a stalwart among HTML editors. I load a handful of visual editors on my PC as needed, but HomeSite stays on my hard drive. Make no mistake, though: This is a professional tool. If you just want to create a simple personal home page, other products are more suitable.

—Paul Heltzel

HomeSite 4.0

PRO: Great for editing code and managing complex sites.

CON: Not a good choice for simple personal pages.

VALUE: Useful tool for experienced Web designers.

List price: download $89, CD-ROM version $99

Allaire

888/939-2545

www.allaire.com

INFONET NO. 718

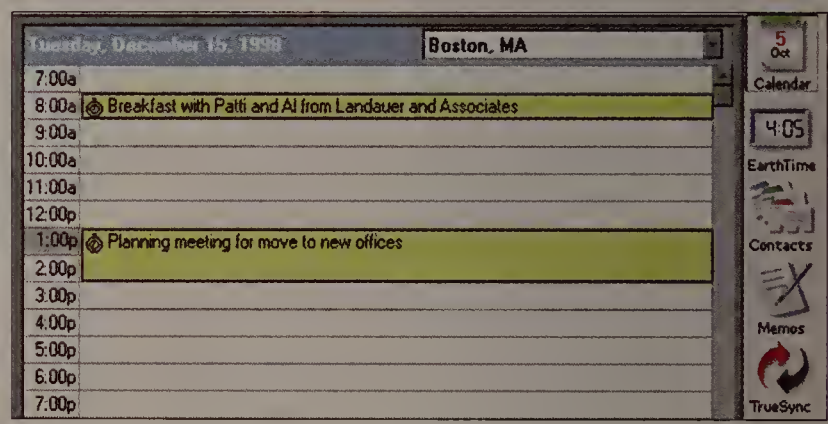
Sidekick 99: Starfish PIM Goes on a Crash Diet

PIM

IN AN AGE when bloated applications tip the disk-space scales at 50MB, 100MB, or more, there's no denying the appeal of Starfish Software's notion of "slimware"—sleek programs that do their work without larding on extraneous features or taking over your hard drive. Judging from the shipping version of **Sidekick 99**, though, Starfish's enthusiasm for weight-watching may be bordering on the obsessive. This new version of the company's venerable personal information manager is all skin and bones.

How so? Rather than adding new tools, the $50 Sidekick 99 mostly eliminates features from Sidekick 98—resulting in a PIM that loads in a flash and consumes just 6MB of disk space. (The earlier version took up 15MB.)

Some of the items Starfish trimmed were more flash than function, such as a wizard that let you publish your calendar on the Web. But power users will be dismayed to learn that Sidekick can no longer track expenses, dial a phone, log activities, or create reports.



SLIM OR ANOREXIC? Sidekick 99's stripped-down feature set includes calendar, clock, contacts, memo pad, and palmtop sync utility.

What you do get is a well-designed but minimalist PIM consisting of a calendar, an address book, a world clock, and a memo pad. You still have the Cardfile, too—a wonderfully useful minidatabase where you can store just about any type of information you want. Among the few new additions: updated import filters and better synchronization with Palm Pilot and REX Personal Digital Assistants. Support for Windows CE devices is in the works.

With its low price and its streamlined interface, Sidekick remains a good PIM for folks who want just the basics. But among current Sidekick users, only palmtop aficionados or people uninterested in the many deleted features are likely to find the upgrade worthwhile.

—Harry McCracken ▶

Sidekick 99

PRO: Small, and easy-to-use, with an attractive price.

CON: Many features removed, only a few added.

VALUE: Most current users should skip the upgrade. But it's still one of the best basic PIMs.

List price: $50; $10 rebate for moving from earlier versions or any competitor

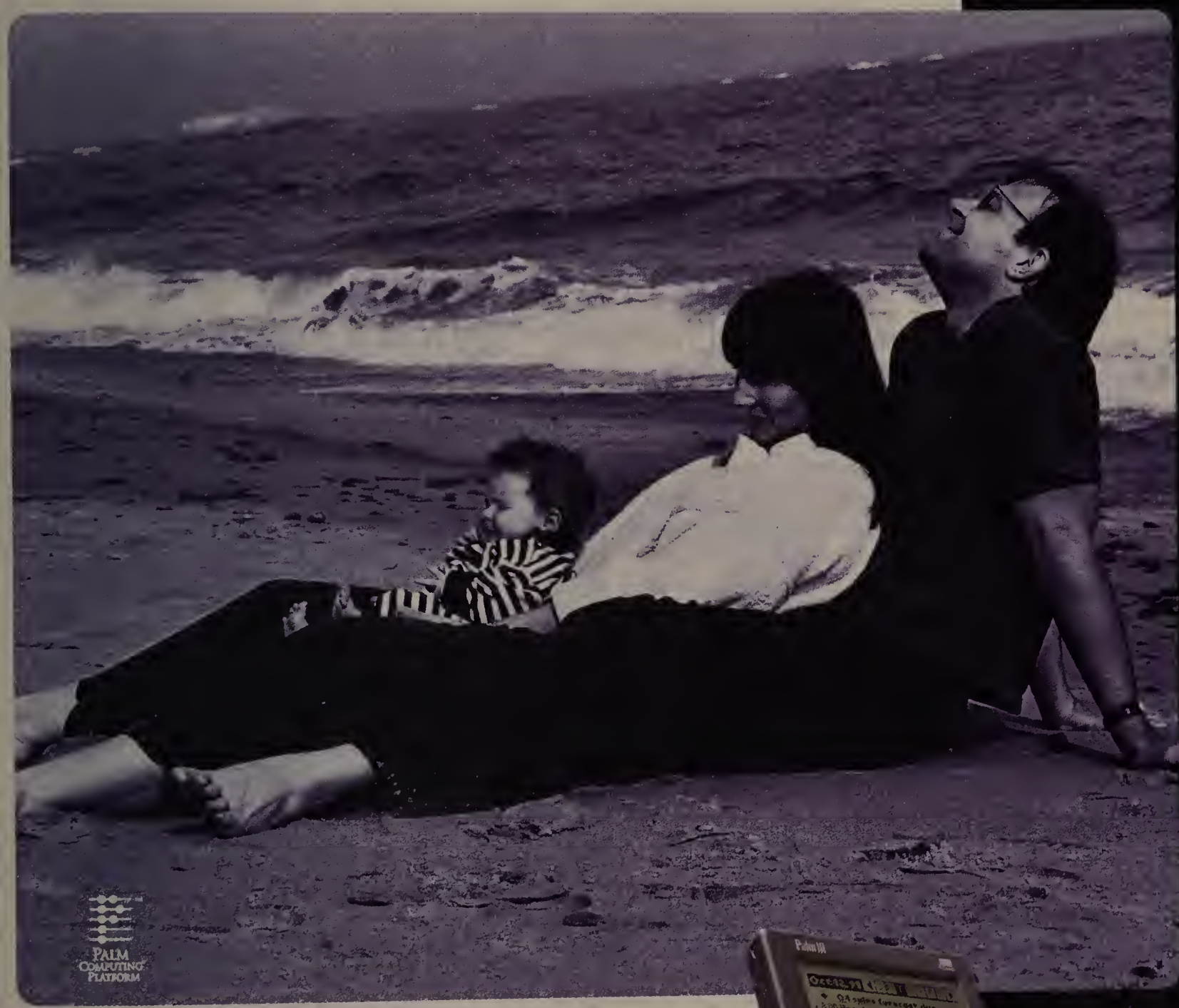
Starfish Software

888/782-7347

www.starfish.com

INFONET NO. 719

ODDLY ENOUGH, GETTING YOUR SCHEDULE STRAIGHT HELPS YOU KEEP YOUR PRIORITIES STRAIGHT.



It fits in your pocket. It's elegantly simple. The Palm III™ connected organizer keeps names, phone numbers, schedules, memos, and e-mail right at your fingertips. And HotSync® technology lets you exchange all that information back and forth with your PC. You can even personalize your organizer with thousands of available applications. Wherever your life takes you, your Palm III organizer can come along. Palm Computing® connected organizers start as low as $249.* To learn more visit www.palm.com or call 1-800-861-2529.

*All prices shown are US suggested retail prices. [illegible] suggested retail price is $299. Palm [illegible] MacPac required for Macintosh connectivity, [illegible] separately for $149.95. [illegible] Macintosh [illegible] and some links to desktop software not supported on Macintosh. [illegible] 1998 3Com Corporation. [illegible] 3Com, the Palm Computing, HotSync and HotSync are registered trademarks and Palm III, Palm OS, Palm Computing platform logo, and the Palm III logo are trademarks of Palm Computing, Inc. or 3Com Corporation. Other products and trademarks may be trademarks or registered trademarks of their respective owners.

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OmniPage Pro 9.0: Good Redo for OCR Veteran

OCR SOFTWARE

NO OPTICAL character recognition application is 100 percent accurate. But if your OCR program's word accuracy falls below 95 percent—that's no more than five errors per 100 words—you're probably wasting your time using it. Caere's new **OmniPage Pro 9.0** makes the grade. And to my mind, Caere's interface is the best in its category.

I tested a preproduction version of OmniPage Pro 9.0, using scanned documents ranging from simple text to pages in multicolumn formats with tables and graphics. OmniPage Pro did best at converting plain-vanilla, laser-printed documents, scoring an impressive 99 percent accuracy (nine errors in 1359 words). It posted 97 percent accuracy reading documents with small text and 96 percent accuracy with multicolumn documents such as magazine pages.

OmniPage Pro is less successful at converting faxed documents, though it does this as well as its competitors have. Its 93 percent accuracy score on this measure was not surprising, considering that the quality of the faxes ranged from good to wretched. On a clean fax, the program had almost no problems. When you do encounter errors, OmniPage Pro's tools for proofreading and correcting are easy to use.

OmniPage Pro 9.0 also offers better support than its predecessor for documents containing color graphics, tables, and spreadsheets. For example, OmniPage can automatically save color elements on a scanned magazine page in frames, convert the text to editable form, and maintain the original layout in a word processor. (It doesn't maintain all the formatting, but it does noticeably better than earlier versions.) And the program adeptly converts gridded tables and spreadsheets, keeping their original formats.

OmniPage Pro lists for a hefty $499, but anyone who already owns an OCR package (including any of the limited versions bundled with most scanners) can purchase an upgrade version for only $99. In light of the hours of retyping this product can save you, it's definitely worth the price.

—*Richard Jantz*

OmniPage Pro 9.0

PRO: Accurate; easy to use; excellent proofing tools.

CON: Like any OCR product, can't convert poor-quality faxes very well.

VALUE: Good deal if you can take advantage of competitive upgrade.

List price: $499; $99 upgrade from any OCR product

Caere

888/922-2373

www.caere.com

INFONET NO. 720

KDS 19-Inch Monitor: Low Price, So-So Quality

MONITOR

THE $488 KDS **Visual Sensation VS-19sn** is one of the least expensive 19-inch monitors we've seen; most cost between $650 and $700. It also features a trendy short-neck design that narrows the case in back, allowing the unit to take up about the same desk space as a 17-inch model. But this monitor does not offer top quality for frequent Web surfers or for people who work extensively with graphics or word processing.

We put a shipping version of the VS-19sn through the same demanding test suite we use for *PC World*'s *Top 10 Monitors* reviews. Set at the recommended resolution of 1280 by 1024, the VS-19sn yielded mixed results.

It did a particularly good job of rendering photographic color—in one photo of a fruit tart, the strawberries looked alluringly crimson. Text was less attractive, with moderate fuzziness, especially when white text was displayed on a dark background (not uncommon on Web pages). Newsletter text was generally legible, but not as sharp as we would have liked. On a test spreadsheet, we noticed blurry text in highlighted cells (the white-text-on-dark-screen effect again).

BIG SCREEN, SHORT NECK: KDS's $488 19-inch monitor requires no more desk space than most 17-inch models, but text can be fuzzy.

The VS-19sn has a full range of animated on-screen control icons and a handy zoom control, but we didn't find the adjustments intuitive. Although this monitor is remarkably inexpensive, its drawbacks for many computer users are significant.

—*Mick Lockey* ▶

Visual Sensation VS-19sn

PRO: Low price for 19-inch monitor; vibrant color.

CON: Text often fuzzy.

VALUE: You get what you pay for.

List price: $488

KDS USA

800/237-9988

www.kdsusa.com

INFONET NO. 721

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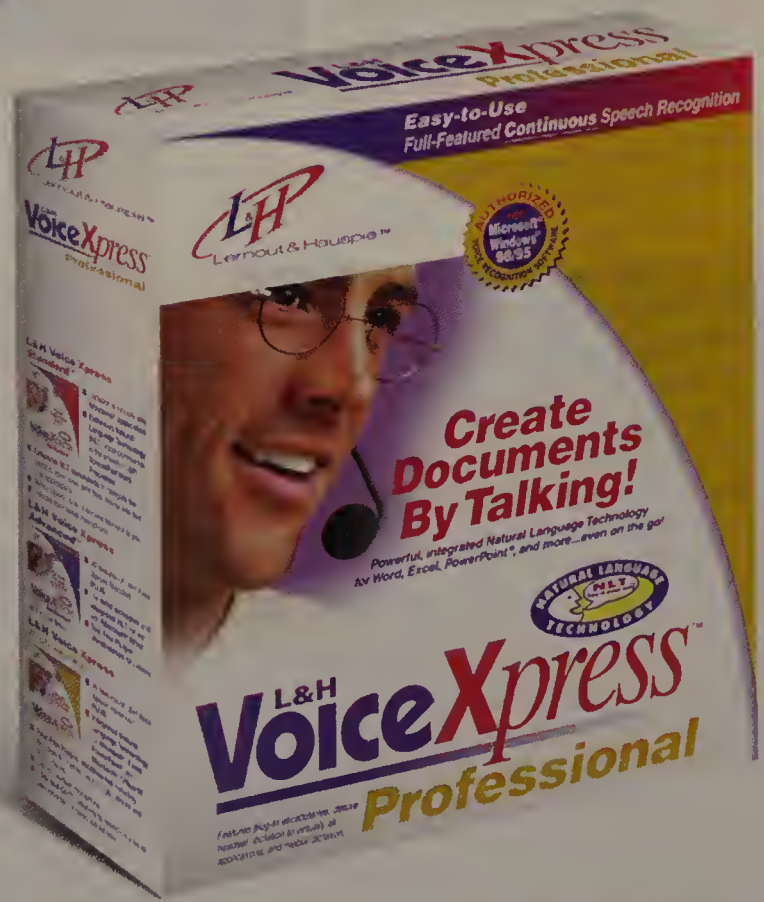

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Desk Savers: Canon's Ultra-Small Flatbeds

SCANNERS

IF YOU'RE LOOKING for an entry-level flatbed scanner that occupies a minimum of desk space, one of two new ultra-compact models from Canon Computer Systems may be exactly what you need. The affordable $79 **CanoScan FB 320P** and $99 **CanoScan FB 620P** weigh only 4.4 pounds each, and their dainty footprints are not much bigger than those of notebook PCs.

These Canons are convenient and effective for home and small offices, so long as scanning speed is not your priority. While the FB 320P and 620P may save you space, similarly priced Universal Serial Bus–ready scanners can get the job done more quickly.

Both of these 30-bit CanoScans share the same design and size (10.1 inches wide by 14.7 inches long by 2.5 inches high). Both connect to your PC via a parallel port and include pass-through ports for connecting other parallel devices (printers, external drives, and so on). They differ, however, in scanning resolution: The FB 320P produces 300-dpi scans (1200 dpi with software interpolation), while the FB 620P supports 600-dpi (2400 dpi interpolated).

SVELTE SCANNERS: The CanoScan FB 320P (above) and FB 620P have small footprints and produce good color and gray-scale quality.

Which unit is right for you? If you plan to enlarge, crop, or retouch photos using an image editing app, the 600-dpi unit is well worth the extra $20. But if you're just scanning in snapshots to post on a personal Web page, the 300-dpi unit works fine.

In my testing of two production units, both proved easy to install and operate, and their scanning quality was quite good. Both CanoScans pro-

LOSE WEIGHT.

duced better-looking color and gray-scale scans than an equally affordable 30-bit flatbed scanner, the $99 Visioneer PaperPort 3100 USB.

On the other hand, the Visioneer USB flatbed delivered its scans a lot faster. For example, the Visioneer scanned an 8-by-10-inch gray-scale photograph at 300 dpi in 40 seconds; a scan of the same photo took about 4.5 minutes—nearly seven times longer—with the CanoScan 320P. For single scans, this may not be a big problem, but if you're scanning in volume, the time starts to add up.

(I should note that my Pentium-200 PC with 64 MB of RAM has an EPP parallel port, not the newer, slightly faster ECP-type parallel port. If you have an ECP port, you should obtain somewhat faster results than I did.)

As for software, Canon bundles a package for Windows 95, Win 98, and NT 4.0 that covers the essential home and small office tasks. Utilities include Canon's own easy-to-use scanning software (ScanCraft and ScanGear); Adobe PhotoDeluxe 2.0 for image editing and enhancing; a copying program; and a light version of ScanSoft TextBridge Plus for OCR. If you plan to do much text conversion, however, you should probably step up to a full-fledged optical character recognition program and jettison the light version.

For image quality, I'd recommend either CanoScan over the Visioneer. But if speed is your biggest concern, look elsewhere. These inexpensive CanoScans—though as fast as other parallel port models—can't keep up with their USB counterparts.

—Richard Jantz ▶

CanoScan FB 320P and 620P

PRO: Ultra-compact; 300- and 600-dpi optical resolutions, respectively.
CON: Slower than USB scanners.
VALUE: Fine choice if scan quality is more important than speed.
Street price: 320P $79, 620P $99
Canon Computer Systems
800/652-2666
www.ccsi.canon.com
INFONET NO. 722

Heavy-Duty Laser

IF YOUR OFFICE churns out huge quantities of black-and-white pages, **Lexmark's Optra S 3455** outdoes the competition on paper capacity, rated speed, and price. For $2249, the 3455 offers a 34-page-per-minute engine and holds 1250 sheets (3750 sheets with additional trays). That beats the $2350 HP LaserJet 8000 and the $2699 Xerox DocuPrint N32. You get the same strong print quality that other Optra S units deliver. The Optra S 3455n, with a 10/100 Ethernet connection and 16MB of RAM, costs $2599. Lexmark Int'l; 800/539-6275; www.lexmark.com.
INFONET NO. 723

—Karen Silver

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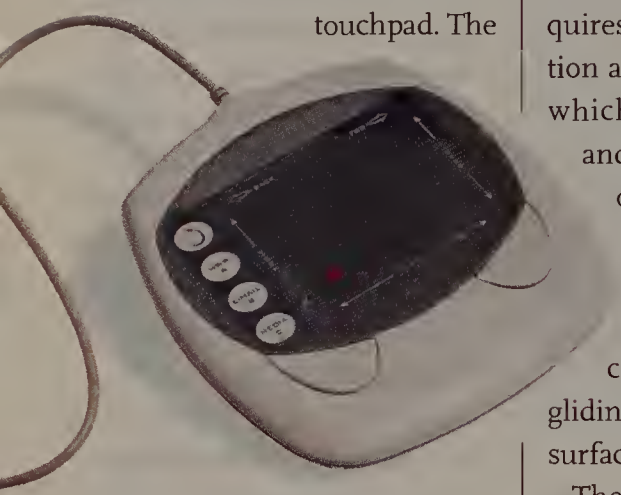
Cirque's Cruise Cat TouchPad: One Cool Kitty

INPUT DEVICE

CIRQUE'S **Cruise Cat TouchPad** could have your mouse for breakfast. A flat panel, roughly 5 inches square, it has four dedicated touch keys on the left side, and left- and right-click buttons just below the touchpad. The preproduction Cruise Cat I tried behaved very much like a real cat. It's intelligent and performs some slick tricks. At first it may seem a bit unfriendly, but in the long run it's very comfy to have around.



FAR FROM MOUSY: Cirque's Cruise Cat TouchPad is highly sensitive and customizable.

Using the Cruise Cat requires little arm or wrist motion and almost no pressure, which should ease comfort and relieve worries for anyone who's concerned about repetitive strain injuries. Moving and dragging the on-screen cursor are as simple as gliding your finger across the surface of the pad.

The Cruise Cat is the most sensitive touchpad I've used. If your only experience with touchpads has been with the often-petulant variety found on notebooks, this one might change your opinion. And if it seems overly sensitive, you can make adjustments via the Glidepoint control panel in Cirque's software.

In fact the dozen setting tabs in the control panel allow all kinds of customization—but impose a long learning curve. Sure, you can make an interactive tutorial run each time you start the control panel—but do you really want to?

Complexity aside, Cirque's customizable features have their charms. The Gestures feature lets you draw a letter or symbol on the pad to specify a corresponding function. I draw a *W* to open Microsoft Word and a *C* to cut highlighted text. You can also set the touch keys on the pad's side to open applications. To scroll quickly through Web pages, you run your finger along the pad's left and bottom edges, which mimic on-screen scrollbars.

The benefits of these features outweigh the software's complexity. And for comfort, the CruiseCat TouchPad is the cat's meow.

—Michael S. Lasky

Cruise Cat TouchPad

PRO: Highly sensitive, customizable and comfortable touchpad.

CON: Customizing settings isn't as easy as it should be.

VALUE: Smart, comfortable alternative to a mouse.

Street price: $79

Cirque

800/454-3375

www.cirque.com

INFONET NO. 724

Timeslips 9.0: Superior Time Billing Software

BILLING

IF YOU NEVER plan to sell a product, have I got the program for you. **Timeslips 9.0** is time and billing software for service businesses—accountants, lawyers, consultants, and other professionals who typically bill by the hour. For users of previous Timeslips editions, version 9.0 is clearly worth the upgrade.

Many general accounting programs, including QuickBooks Pro and Peachtree Accounting, provide time and billing features, but Timeslips 9.0 offers more specialized capabilities. For example, you can specify rules for minimum and maximum time charges, or arrange to bill for flat fees with add-ons. Many defaults and shortcuts speed up entry of time charges.

A top-notch new report designer lets you customize the information presented on an invoice. You can even change the bill format for each client, showing as much or as little charge detail as required.

Version 9.0 offers other significant improvements over previous versions. The most notable: a better user interface, a more robust database, better tracking of accounts receivable, new minimum billing rules, and fee allocation to apportion billings between the individual who sells the work and the one who performs it. These improvements make the latest Timeslips suitable for firms employing up to 100 professionals.

Timeslips 9.0 is a scalable product, so you buy only what you need. Level 1 ($180) is limited to two timekeepers and lacks practice-management reporting and certain profession-specific features, such as the percent-complete flat-fee billing method used by architects. Level 2 ($400) supports eight timekeepers and includes practice-management but not fee-allocation reporting. Level 3 ($1000) allows 100 timekeepers and up to 30,000 clients, and it has the most features.

Timeslips is not a complete accounting solution. To create financial statements, you'll need Timeslips Accounting Link, which transfers data to QuickBooks, M.Y.O.B., and 30-odd accounting packages. TAL is free for first-time Timeslips buyers and previous TAL owners, $100 for Timeslips upgraders who've never bought TAL. For my money, Timeslips 9.0 is hard to beat.

—Richard Morochove ■

Timeslips 9.0

PRO: Very flexible time tracking and billing software; scalable.

CON: Nothing significant.

VALUE: Excellent choice for service businesses and professionals.

List price: $180, $400, or $1000 (depending on level)

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www.timeslips.com

INFONET NO. 725

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#1 RANKING FOR POWER PRODUCTS

1. Power users have long known that Micron systems are among the absolute best in the industry. The editors of *PC World* Magazine just ranked Micron's Millennia desktop line as the #1 Power Desktop, #1 Home Desktop & #1 Consumer Desktop while *CNET* just named the Micron GoBook the #1 UltraPortable on the market today.

#1 RANKING FOR CUSTOMER SATISFACTION

2. Micron's customers are really satisfied — just ask them. In fact, the influential readers of industry bible *PCWeek* ranked Micron desktops #1 in total customer satisfaction.‡‡ And *Home PC* readers voted Micron #1 in providing the industry's best service and support.

MICRON GOES TO WORK

"Micron's support policies are first-rate, with a three-year parts and one-year labor warranty and 24-hour toll-free phone support seven days a week."

- *PC World*, "Best Buy," August '98

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Micron Systems:
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Favorite Feature:
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Purpose:
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For The Whole Story: www.micronpc.com

Tim Willits
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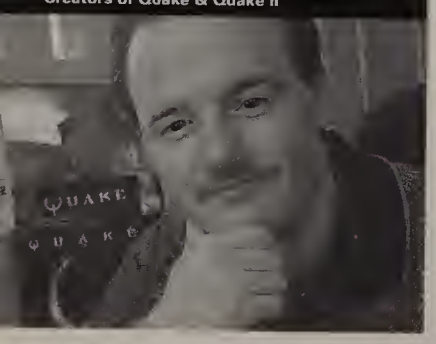

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Just named #1 450MHz desktop by the editors of *CNET* and #1 Power Desktop by the editors of *PC World* Magazine (Millennia 400 DVD • October '98, Millennia® MAX 450 • *PC World* Best Buy November '98), Micron's Millennia desktop product line continues a long tradition of industry-leading, award-winning performance. Perhaps that's why some of the most prominent power users around rely on Micron. No matter how strenuous your demands, no matter how colossal the task, we invite you to put a Millennia desktop to the test. You'll be hard-pressed to find a Pentium® II processor based system as powerful and affordable as the Micron™ Millennia. And Micron's revolutionary new MPower℠ purchase program makes Millennia ownership even easier, offering qualified users no interest◊◊ or payments for six months as well as PowerXchange℠ trade-in options on your current Pentium processor class PC towards a new Millennia desktop.

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◊◊TechRefresh lease prices are based on a 36-month lease and are available to business customers. Businesses can qualify for 60-day same-as-cash and individuals for 6-month same-as-cash programs. If purchase advance and related charges are not paid in full within 60 days from purchase date for business or within 180 days from purchase date for individuals, finance charges will be assessed from purchase date. APR varies and is 17.65% as of 8/25/98 with a minimum finance charge of $1.00. Term financing is available to individuals for home or business use. PowerXchange accepts trade in of most major computer brands. Please call for details and the latest qualified brand list. Cash rebates are based on the average wholesale value of your PC per the Orion Blue Book, or other source chosen by Micron, adjusted for condition at trade-in.
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4. Only Micron offers you the option to trade in and trade up today. Trade in your current Pentium processor-class computer system(s) from leading manufacturers and we'll give you wholesale rebates with the purchase of new Micron systems. We'll even send you boxes to package up your old PCs.

New Rules. New Tools.™

The Micron Difference: Rock-Solid Reliability. MPower℠ and PowerXchange℠ Programs. Industry-Leading Service and Support.

There's a lot more to owning a system than having a computer sitting on your desk. You'll always want the latest technology, great pricing and service and support you can count on — and that's exactly what Micron's new MPower program is all about. Call today for details or visit www.micronpc.com/pcwd.

intel inside pentium® II PROCESSOR

Award-Winning Complete Internet-Ready† 450MHz Systems Starting at Just $1,699

Model Name	Millennia C333	Millennia 350	Millennia 450 (New!)	Millennia 450 MAX (New!)	Millennia 450 MAX (New!)
Processor	Intel® Celeron™ processor 333MHz	Intel Pentium® II processor 350MHz	Intel Pentium II processor 450MHz	Intel Pentium II processor 450MHz	Intel Pentium II processor 450MHz
Cache	128KB internal L2 cache	512KB internal L2 cache	512KB internal L2 cache	512KB internal L2 cache	512KB internal L2 cache
RAM	32MB SDRAM	64MB 100MHz SDRAM	64MB 100MHz SDRAM	128MB 100MHz SDRAM	128MB 100MHz SDRAM
Hard Drive	4.3GB Ultra ATA hard drive*	8.4GB Ultra ATA hard drive*	8.4GB Ultra ATA hard drive*	13.6GB Ultra ATA hard drive*	14.4GB 7200 RPM Ultra ATA hard drive*
Monitor	15" Micron 500Vx monitor (13.8" display)	17" Micron 700Vx monitor (15.9" display)	17" Micron 700Vx monitor (15.9" display)	17" Micron 700Vx monitor (15.9" display)	19" Micron 900Lx monitor (18" display)
DVD/CD-ROM	32X max speed CD-ROM drive	32X max speed CD-ROM drive	32X max speed CD-ROM drive	32X max speed CD-ROM drive	4.8X DVD-ROM drive
Modem	3Com/U.S. Robotics 56K WinModem**	3Com/U.S. Robotics 56K WinModem**	3Com/U.S. Robotics 56K WinModem**	3Com/U.S. Robotics 56K WinModem**	3Com/U.S. Robotics 56K WinModem**
Graphics	nVidia Riva 128, 4MB SGRAM 3D AGP graphics	nVidia Riva 128, 8MB SGRAM 3D AGP graphics	nVidia Riva 128, 8MB SGRAM 3D AGP graphics	nVidia Riva 128, 8MB SGRAM 3D AGP graphics	Diamond Viper 550 nVidia TnT, 16MB graphics
Sound System	PCI 64-voice Wavetable sound	PCI 64-voice Wavetable sound	PCI 64-voice Wavetable sound	PCI 64-voice Wavetable sound	PCI 64-voice Wavetable sound
Warranty	5-year/3-year Micron Power℠ limited warranty	5-year/3-year Micron Power limited warranty	5-year/3-year Micron Power limited warranty	5-year/3-year Micron Power limited warranty	5-year/3-year Micron Power limited warranty
Software Included	Microsoft® Windows® 98 Microsoft Home Essentials Horton AntiVirus	Microsoft Windows 98 Microsoft Office 97 Small Business Edition Microsoft Outlook Microsoft Internet Explorer Horton AntiVirus	Microsoft Windows 98 Microsoft Office 97 Small Business Edition Microsoft Outlook Microsoft Internet Explorer Horton AntiVirus	Microsoft Windows 98 Microsoft Office 97 Small Business Edition Microsoft Outlook Microsoft Internet Explorer Norton AntiVirus	Microsoft Windows 98 Microsoft Office 97 Small Business Edition Microsoft Outlook Microsoft Internet Explorer Horton AntiVirus
Also Includes:	New MicroTower™ case Advent AVD09 stereo speakers 104-key enhanced keyboard Microsoft IntelliMouse® 3.5" floppy drive	New MicroTower case Advent AV009 stereo speakers 104-key enhanced keyboard Microsoft IntelliMouse 3.5" floppy drive	New MicroTower case Advent AV009 stereo speakers 104-key enhanced keyboard Microsoft IntelliMouse 3.5" floppy drive	Micron MiniTower case Advent AV009 stereo speakers 104-key enhanced keyboard Microsoft IntelliMouse 3.5" floppy drive	Micron MiniTower case Monsoon MM1000 flat panel speakers w/subwoofer 100MB Iomega Zip Drive 104-key enhanced keyboard Microsoft IntelliMouse 3.5" floppy drive
Price	$1,249 — $44/mo. TechRefresh Bus. Lease, 36 mos.**	$1,499 — $52/mo. TechRefresh Bus. Lease, 36 mos.**	$1,699 — $59/mo. TechRefresh Bus. Lease, 36 mos.** New Low Price!	$2,499 — $87/mo. TechRefresh Bus. Lease, 36 mos.**	$2,899 — $101/mo. TechRefresh Bus. Lease, 36 mos.** New Low Price!
Upgrade to:	Upgrade to: 64MB SDRAM memory 6.4GB Ultra ATA hard drive 17" Micron 700Vx monitor (15.9" display) 100MB Iomega Zip drive	Upgrade to: 128MB SDRAM memory 10GB Ultra ATA hard drive 17" Micron Trinitron 700Tx monitor (16" display) 100MB Iomega Zip drive	Upgrade to: 128MB SDRAM memory 13.6GB Ultra ATA hard drive 19" Micron 900Lx monitor (18" display) 4.8X DVD-ROM drive	Upgrade to: 100MB Iomega Zip drive Monsoon MM1000 flat panel speakers w/subwoofer 19" Micron Trinitron monitor (18" display)	Upgrade to: 256MB 100MHz SDRAM Microsoft Natural Keyboard Elite
Price	$1,545 — $54/mo. TechRefresh Bus. Lease, 36 mos.**	$1,932 — $68/mo. TechRefresh Bus. Lease, 36 mos.**	$2,232 — $78/mo. TechRefresh Bus. Lease, 36 mos.** New Low Price!	$2,866 — $100/mo. TechRefresh Bus. Lease, 36 mos.**	$3,214 — $112/mo. TechRefresh Bus. Lease, 36 mos.** New Low Price!

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†Contract with outside Internet Service Provider required. Internet service questions must be resolved by ISP and is not included.

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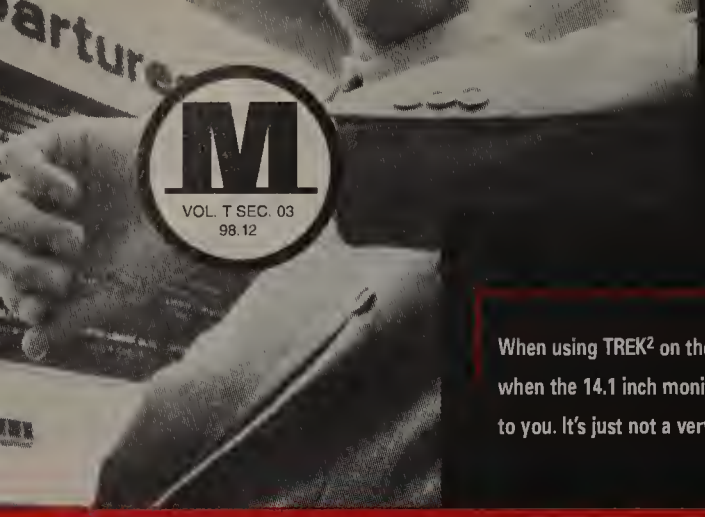

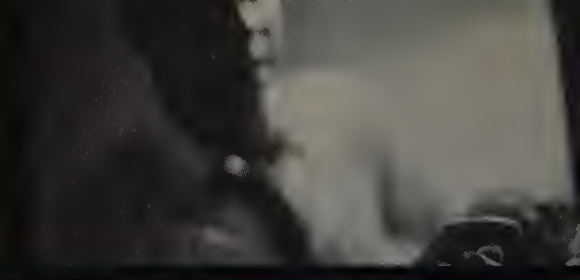

HELP FOR THE MOBILE WORKAHOLIC

When using TREK² on the plane, try not to laugh when the 14.1 inch monitor dwarfs the guy's next to you. It's just not a very nice thing to do.

Pack light — there's nothing worse than a carry-on that leaves divots in your shoulder, which is why the TREK² is as thin as 1.7" and as light as 7.2lbs.

Avoid the isolation induced by the single-use, personal mini-soaps of the hotel room by stayin connected with an optional 56K modem.**

IT'S ALMOST SILLY TO CALL A 300MHz NOTEBOOK WITH DVD, AGP GRAPHICS AND A 14.1" DISPLAY A "BUDGET PORTABLE"

TREK ²

AMY ALCORN, MD

Pediatrician
System: Micron TransPort TREK
Favorite Feature: Brilliant Display
Purpose: Online Medical Research
For The Whole Story: www.micronpc.com

BOB PARKER

Owner/Founder Parker Motor Sports
Dominant Indy Race Car Team
Systems: Micron TransPort TREK Notebooks/
Millennia Desktops
Favorite Feature: Speed — Of Course!
Purpose: Telemetry between Indy Car and Pit Crew
For The Whole Story: www.micronpc.com

New! 300MHz
14.1" XGA TFT display
64MB SDRAM
3.2GB hard drive (removable)
DVD-ROM drive
Just $2,999

PENTIUM® II PROCESSOR POWER, AGP GRAPHICS, DVD AND A 14.1" DISPLAY AT BREAKTHROUGH PRICING

"The TransPort TREK is the Fastest Budget Notebook We've Run Through Our Mill."††
—*PC World*, Ranked #1, "Best Buy," April '98

Experts and industry pundits all agree that Micron makes some of the world's best notebooks. Our product lines have won the coveted *PC Magazine* Editors' Choice award along with a myriad of other prestigious awards. And the new TransPort® TREK™ is no exception. *PC World* ranked the new TransPort TREK the #1 budget notebook available today††. And with a Pentium II processor 300MHz, AGP graphics, optional DVD and a gigantic 14.1" display, the TransPort TREK² is one of the best desktop replacements you can buy. Call Micron today and get a TransPort TREK² custom configured to your specific needs direct from the factory at unbelievably low prices.

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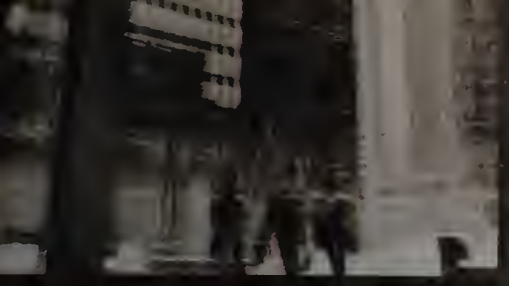
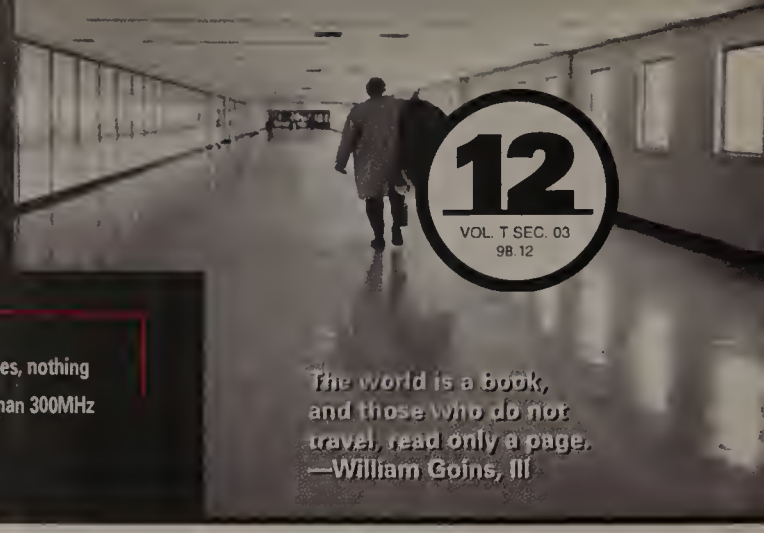
TechRefresh lease prices are based on a 36-month lease and are available to business customers. Businesses can qualify for 60-day same-as-cash and individuals for 6-month same-as-cash programs. If purchase advance and related charges are not paid in full within 60 days from purchase date for business or within 180 days from purchase date for individuals, finance charges will be assessed from purchase date. APR varies and is 17.65% as of 8/25/98 with a minimum finance charge of $1.00. Term financing is available to individuals for home or business use. PowerXchange accepts trade in of most major computer brands. Please call for details and the latest qualified brand list. Cash rebates are based on the average wholesale value of your PC per the Orion Blue Book, or other source chosen by Micron, adjusted for condition at trade-in.

A non-refundable up-front freight charge applies for participation in PowerXchange to cover cost of return packaging and processing.



Clients Don't Come To You



Work hard, but leave time for some major goofing off. And with a DVD-ROM drive and 3.5" floppy included, whether it's games or work, you'll have access to it all.

Don't be afraid to hug your notebook. Sometimes, nothing is more comforting to the weary road warrior than 300MHz of mobile desktop-replacing power.

Now Featuring
Brilliant 14.1" Display!
DVD-ROM drive!

Model Name	TREK² 233	TREK² 233	TREK² 266	New! TREK² 300
Processor	Intel® Pentium® II processor 233MHz	Intel Pentium II processor 233MHz	Intel Pentium II processor 266MHz	Intel Pentium II processor 300MHz
Cache	512KB L2 pipeline burst cache	512KB L2 pipeline burst cache	512KB L2 pipeline burst cache	512KB L2 pipeline burst cache
RAM	32MB EDO DRAM	64MB SDRAM	64MB SDRAM	64MB SDRAM
Hard Drive	3.2GB hard drive (removable)✧	3.2GB hard drive (removable)✧	3.2GB hard drive (removable)✧	3.2GB hard drive (removable)✧
Monitor	12.1" SVGA TFT display	13.3" XGA TFT display	14.1" XGA TFT display	14.1" XGA TFT display
Extra Storage	3.5" floppy disk drive (dedicated bay)	3.5" floppy disk drive (dedicated bay)	3.5" floppy disk drive (dedicated bay)	3.5" floppy disk drive (dedicated bay)
DVD/CD-ROM	24X CD-ROM drive (dedicated bay)	24X CD-ROM drive (dedicated bay)	24X CD-ROM drive (dedicated bay)	DVD-ROM drive (dedicated bay)
Graphics	4MB AGP graphics accelerator	4MB AGP graphics accelerator	4MB AGP graphics accelerator	4MB AGP graphics accelerator
Sound System	Built-in stereo speakers & microphone	Built-in stereo speakers & microphone	Built-in stereo speakers & microphone	Built-in stereo speakers & microphone
Warranty	5-year/1-year Micron limited warranty	5-year/1-year Micron limited warranty	5-year/1-year Micron limited warranty	5-year/1-year Micron limited warranty
Software Included	Microsoft® Windows® 98 System Wizard Mobile Client™ Norton AntiVirus	Microsoft Windows 98 Microsoft Office Small Business Edition System Wizard Mobile Client™ Norton AntiVirus	Microsoft Windows 98 Microsoft Office Small Business Edition System Wizard Mobile Client™ Norton AntiVirus	Microsoft Windows 98 Microsoft Office Small Business Edition System Wizard Mobile Client™ Norton AntiVirus
Also Includes:	Zoomed Video capable Li-Ion battery (dedicated bay) Microphone, stereo line-in/out jacks Touchpad pointing device CardBus ready S-Video & NTSC out; MPEG compatible Wavetable/3D Positional Sound 2-way fast infrared port 2 Type II/1 Type III PCMCIA slots 2-USB, parallel, serial, VGA, PS/2 ports	Zoomed Video capable Li-Ion battery (dedicated bay) Microphone, stereo line-in/out jacks Touchpad pointing device CardBus ready S-Video & NTSC out; MPEG compatible Wavetable/3D Positional Sound 2-way fast infrared port 2 Type II/1 Type III PCMCIA slots 2-USB, parallel, serial, VGA, PS/2 ports	Zoomed Video capable Li-Ion battery (dedicated bay) Microphone, stereo line-in/out jacks Touchpad pointing device CardBus ready S-Video & NTSC out; MPEG compatible Wavetable/3D Positional Sound 2-way fast infrared port 2 Type II/1 Type III PCMCIA slots 2-USB, parallel, serial, VGA, PS/2 ports	Zoomed Video capable Li-Ion battery (dedicated bay) Microphone, stereo line-in/out jacks Touchpad pointing device CardBus ready S-Video & NTSC out; MPEG compatible Wavetable/3D Positional Sound 2-way fast infrared port 2 Type II/1 Type III PCMCIA slots 2-USB, parallel, serial, VGA, PS/2 ports
Price	$1,799 $63/mo. TechRefresh Bus. Lease, 36 mos.**	$2,299 $80/mo. TechRefresh Bus. Lease, 36 mos.**	$2,599 $91/mo. TechRefresh Bus. Lease, 36 mos.**	$2,999 $105/mo. TechRefresh Bus. Lease, 36 mos.**

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Micron™ notebooks are among the very best available. Our notebooks have been critically acclaimed by industry pundits and power users alike. And the TransPort TREK² is no exception. Call Micron today and order any of our award-winning notebooks custom configured to meet your specific needs.

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It's about more than just maintaining a network. Throw in responsibility for everything from explaining the secrets of "data packets" to a CEO who uses his notebook for solitaire to keeping the information pipeline for 100+ Web-surfing, e-mail dependant, hyper-busy co-workers up and running, then

MICRON AND MICROSOFT TEAM UP TO BRING YOU THE POWER OF WINDOWS NT®.

CRITICS RAVE ABOUT THE MICRON CLIENTPRO

"The Micron ClientPro 400 succeeds in providing an optimized LANDesk Management Solution and combines it with top performance at a good price."

— *PC Magazine*
June 30, 1998

"Micron ClientPro provides "gracious plenty" for corporate IS and small-business buyers alike...This Windows NT 4.0 workhorse comes ready to network, with a preinstalled 3Com Etherlink LAN adapter card and Intel's remote control software for system monitoring."

— *PC World*
November '98

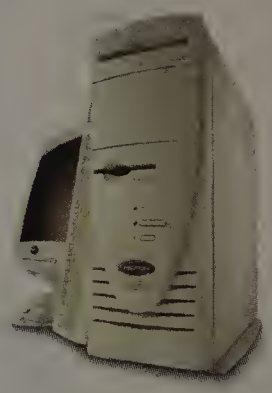
If you're looking for complete network solutions, or simply need to upgrade your current network, consider Micron™ ClientPro® managed PCs and Micron NetFRAME® servers. Network-ready right out of the box, packing the power of the Intel® Pentium® II processor 450MHz, and built on industry standards, the ClientPro effortlessly puts more manageable power in your office. And if you're looking for a reliable and expandable server, it would be tough to beat Micron's NetFRAME servers running with the powerful new Intel Pentium II Xeon™ processor.

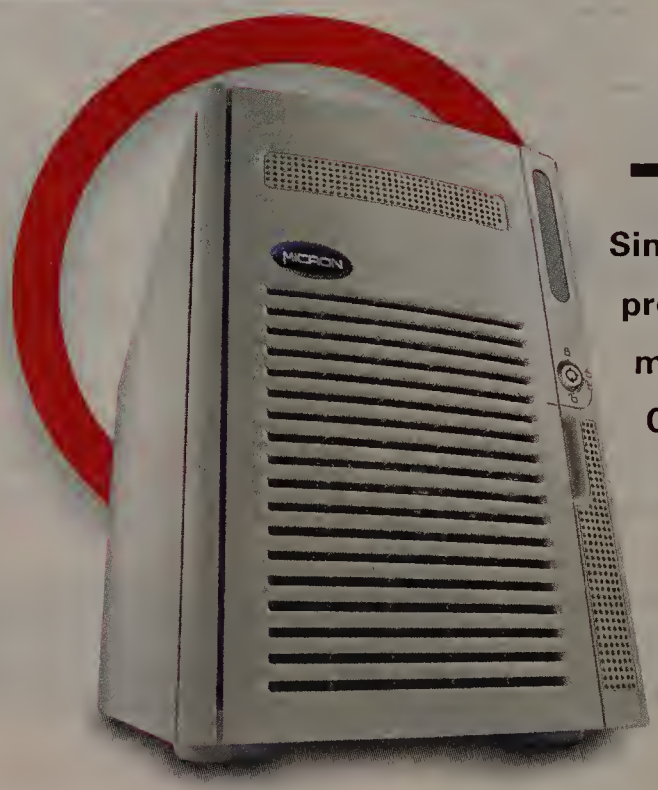
"MICRON'S NETFRAME 3100 GIVES YOUR WEB CUSTOMERS WHAT THEY WANT BEFORE THEY CLICK AWAY."

— *PC Computing*, A-List Top Pick, Nov. '98

"MICRON'S DUAL-PROCESSOR... SERVER RUNS FULL SPEED AHEAD."

— *PC Computing*, A-List Editors' Choice





Since 1985 Micron's line of NetFRAME servers has been providing rock-solid, tireless service, becoming one of the most highly-regarded brands on the server market today. Combining advanced technology, superlative engineering and industry-leading service and support, Micron's award-winning line of NetFRAME servers continues to push the price/performance envelope and exceed user expectation.

Introducing the New Micron NetFRAME 6200

PC WORLD BEST BUY
ClientPro CS 400
Nov '98

PC Computing THE A LIST
Best Web Server
NetFRAME 3100
Nov '98

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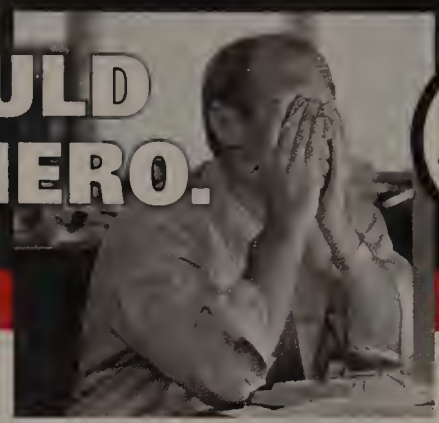
TechRefresh lease prices are based on a 36-month lease and are available to business customers. Businesses can qualify for 60-day same-as-cash and individuals for 6-month same-as-cash programs. If purchase advance and related charges are not paid in full within 60 days from purchase date for business or within 180 days from purchase date for individuals, finance charges will be assessed from purchase date. APR varies and is 17.65% as of 8/25/98 with a minimum finance charge of $1.00. Term financing is available to individuals for home or business use. PowerXchange accepts trade in of most major computer brands. Please call for details and the latest qualified brand list. Cash rebates are based on the average wholesale value of your PC per the Orion Blue Book, or other source chosen by Micron, adjusted for condition at trade-in.

you're starting to scratch the surface. Let's face it, when you're crawling around under someone's desk in a jungle of twisted cables because they want to see the dancing baby and you're the only one in the office that understands that "hot-swappable hard-drives" aren't something dirty, the last thing you need is a server that's anything but flawless.

THEY SHOULD CALL ME HERO.



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WINDOWS NT FACT: Micron Was The First PC Company To Ship Windows NT In The Summer Of '94

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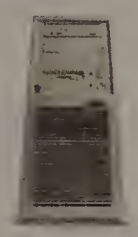
New!
ClientPro CS 450

Intel® Pentium® II processor 450MHz
512KB internal L2 cache
128MB SDRAM
6.4GB Ultra ATA hard drive*
17" Micron 700Vx (15.9" display)
32X max speed CD-ROM drive
Diamond Viper 330 nVidia, 4MB AGP video
64-voice PCI Wavetable sound
3Com 3C905 WOL 10/100 network card
5-year/3-year Micron Power℠ limited warranty

Intel LANDesk® Client Manager
Microsoft® Windows NT® Workstation 4.0
Norton AntiVirus

SMART II hard drive monitoring
Chassis intrusion detection
Fan, temperature, and voltage problem reporting
Virus detection reporting
Remote Wake Up capability
MiniTower case
3.5" floppy drive
104-key enhanced keyboard
Microsoft IntelliMouse®

$2,099 $73/mo. TechRefresh Bus. Lease, 36 mos.



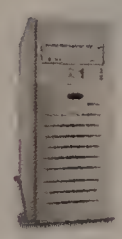
New!
NetFRAME 2101

Intel Pentium II processor 333MHz
512KB internal L2 ECC cache
64MB ECC SDRAM
4GB Ultra Wide SCSI-3 hard drive*
32X max speed CD-ROM drive
5-year/3-year Micron Power limited warranty
Dedicated server technical support, 7x24
1-year next-business-day on-site service†††

Intel LANDesk Server Manager
Emergency Management Port Console

Supports up to two Intel Pentium II processors
Intel 440BX PCI chip set
100MHz front side bus and up to 1GB memory support
Integrated Symbios PCI Ultra Wide SCSI-3 dual channel controller
Intel PRO/100+ Server Adapter
Integrated RAID upgrade support
5 expansion slots: 3 PCI, 1 ISA, 1 shared PCI/ISA
10 drive bays: 1 external 3.5", 3 external 5.25"
6 internal 1.0" hard drive bays (54GB max.)
Integrated SVGA graphics 2MB
Microsoft mouse, 104-key enhanced PS/2 keyboard
3.5" floppy drive

$1,899 $66/mo. TechRefresh Bus. Lease, 36 mos.



NetFRAME 3100

Intel Pentium II processor 400MHz
512KB internal L2 ECC cache
64MB ECC 100MHz SDRAM
4GB Ultra Wide SCSI-3 hard drive*
32X max speed CD-ROM drive
5-year/3-year Micron Power limited warranty
Dedicated server technical support, 7x24
1-year next-business-day on-site service†††
NOS support (3 first-year incident resolutions), 7x24

Intel LANDesk Server Manager
Emergency Management Port Console
Microsoft Windows NT Server 4.0 (10-user license)

Supports up to two Intel Pentium II processors
Intel 440BX PCI chip set
100MHz front side bus and up to 1GB memory support
Integrated Symbios PCI Ultra Wide SCSI-3 dual channel controller
Intel PRO/100+ Server Adapter
Integrated RAID upgrade support
5 expansion slots: 3 PCI, 1 ISA, 1 shared PCI/ISA
8 drive bays: 1 external 3.5", 2 external 5.25"
5 hot-swap redundant 1.0" hard drive bays
Integrated SVGA graphics 2MB
Microsoft mouse, 104-key enhanced PS/2 keyboard
3.5" floppy drive

$3,599 $116/mo. TechRefresh Bus. Lease, 36 mos.

New!
NetFRAME 6200
High-Powered Server For Fast-Growing Businesses

Intel Pentium II Xeon™ processor 400MHz
512KB integrated L2 ECC cache
128MB ECC EDO DRAM
9GB U2W LVDS SCA 1" hard drive*
32X SCSI CD-ROM drive
5-year/3-year Micron Power limited warranty
Dedicated server technical support, 7x24
1-year next-business-day on-site service†††
NOS support (3 first-year incident resolutions), 7x24

Intel LANDesk Server Manager 6.0
Emergency Management Port Console
Microsoft Windows NT Server 4.0 (10-user license)

Supports up to four Intel Pentium II Xeon processors
Options for 512KB or 1MB L2 cache Xeon processor
Intel 450NX PCI chip set
4GB ECC EDO support (16 DIMM sockets)
7 expansion slots: 6 PCI, 1 shared ISA/PCI
Integrated Symbios U2W LVDS dual channel controller
Integrated Symbios narrow SCSI controller
Intel PRO/100+ Server Adapter w/Adaptive Load Balancing and Adapter Fault Tolerence software
6 internal, hot-swappable hard drives bays
1 hot-swappable 400-watt power supply (upgradable to three w/redundancy)
Integrated SVGA graphics 2MB
3 external 5.25" media bays
Free-standing pedestal chassis standard (rack mount option available)
Emergency Management Port (EMP)
ICMB and cluster support
104-key Enhanced PS/2 keyboard
Microsoft mouse
1 parallel, 2 serial ports
3.5" floppy drive
• Add 3Com Gigabit EtherLink Network Interface Card for $800*

$6,999 $226/mo. TechRefresh Bus. Lease, 36 mos.

THE NEW MICRON NETFRAME 6200 IS THE FIRST SERVER AVAILABLE ANYWHERE WITH 3COM'S GIGABIT ETHERLINK SERVER NETWORK INTERFACE CARD.

The 3Com® Gigabit EtherLink® Server Network Interface Card features full duplex 32/64-bit gigabit performance, providing instant relief from server bandwidth problems. And 3Com's DynamicAccesss® software optimizes network performance and adds intelligence to the server Network Interface Card.

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THE 7 SMARTEST PC Upgrades

FOR Under $200

Whether they're CPUs or CD-ROM drives, modems or memory—some upgrades make sense, some don't.

THAT OLD 486 sitting in your garage seems like it could run forever, but it won't run Windows 98. The Pentium-133 your company bought two years ago is already showing symptoms of a midlife crisis—especially when you load Office 97. The most popular applications guarantee to improve your productivity, provided they don't bring your PC to its knees first.

You know you need a new computer. Who doesn't? But maybe you'd rather burn that cash on a trip to Paris instead of on a PII-450. By selectively upgrading parts of your PC, you can wring a little more life out of your PC—and still save for a stroll down the Champs Elysées.

Upgrading has its limits, however. In an era when you can buy a new Pentium II for less than $1000, you shouldn't spend much more than $200 to soup up an older system. Does it make sense to spring for more memory, or should you cash in your chips on a new CPU? Would you be better served by a swifter video card or a speedy 56-kbps modem? How about a bigger hard drive? A DVD-ROM player? A USB port?

Our guide to upgrading your computer will help you decide where to focus your efforts and your dollars—or whether to forgo upgrading altogether. We provide an overview of key system enhancements—memory, CPUs, storage devices, graphics cards, modems, and more. Check out our handy decision trees to figure out the best solution for your situation, then peruse the tables to get a handle on the technical challenge that awaits. Can't face the terror of a hard disk upgrade? We even spell out what a professional installation will cost.

Whether you want to run the latest version of Microsoft Office, move up to Windows NT, or just play Quake II, we'll help you decide which parts of your PC to upgrade and which ones to leave alone. As for the money you'll save, well, you'll have to decide how to spend that yourself. ▶

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ILLUSTRATIONS BY JAMES STEINBERG

MEMORY MATTERS

WITH SYSTEM RAM prices at historical lows, a memory upgrade is the most cost-effective update you can make to your computer. No matter what kind of Windows machine you have, adding memory should make it noticeably faster. The extra RAM will reduce your PC's performance-sapping reliance on virtual memory, a Windows trick that induces the hard drive to act as surrogate memory when space in RAM gets tight. With all active data in fast RAM, other system components like your CPU and graphics card can work up to their potential, rather than having to wait around for the hard disk.

If you're plodding along with an old 486 that has only 8MB of RAM, you should upgrade to at least 16MB—and a jump to 32MB will boost Windows 95 performance even more. Adding 16MB of RAM to a Pentium system that already has 16MB installed will give you a nice performance boost for under $50. And if you're starting at 32MB, you might want to increase to 64MB—the extra 32MB still costs less than dinner for two at a swanky restaurant. If you like to run a lot of applications at the same time—especially RAM-hungry software such as Microsoft PowerPoint or Lotus Notes–you'll appreciate having the extra memory.

DIFFERENT MEMORIES

BEFORE YOU UPGRADE, you'll need to figure out exactly what type of memory you have, and what you should replace it with. The easiest way is to dial up the Web site of a large memory vendor like Kingston Technology (www.kingston.com) or Crucial Technology (www.crucial.com). Plug in the make and model of your computer, and the site will tell you what kind of RAM your PC uses and quote a price for it. Most Pentium and some Pentium MMX models came with EDO DRAM organized on 72-pin single inline memory modules. You must install SIMMs in pairs; so a 32MB upgrade, for example, consists of two 16MB SIMMs. Newer Pentium MMX and most Pentium II systems use faster SDRAM, which is mounted on 168-pin dual inline memory modules, and DIMMs can be installed one at a time. If you own an old 486, you're probably using 32-pin SIMMs containing old Fast Page Mode DRAM.

While most Pentium II and Pentium Pro systems feature memory with parity or error correcting code for detecting corrupted data, many Pentium and Pentium MMX systems use simpler nonparity memory. You'll need to identify the type of data protection in your current RAM and make sure your new memory matches it. You may be able to tell by counting the number of chips on the memory module itself. If you see nine chips on a side, the memory type is likely parity or error correcting; otherwise, it is nonparity.

PICK UP THE PACE

SOME PENTIUM MMX systems shipped with EDO DRAM but included a pair of open DIMM sockets for accommodating faster SDRAM down the road. While some motherboards can work with both SIMMs and DIMMs in place, you can avoid potential problems and system slowdowns by sticking with just one memory flavor. Owners of new 100-MHz motherboards—including Pentium II-350 and AMD K6-2-350 CPUs—should take care when stocking their PCs with new SDRAM. The faster bus clock requires more sophisticated memory, often called PC100 SDRAM. Slower PC66 SDRAM may fail when plugged into a faster motherboard.

The bottom line: Whether you want to run business presentations, craft eye-straining spreadsheets, or play the latest games, you can quicken the pace by adding memory to that aging machine.

—Michael Desmond

Snapshot: Memory Upgrades

IF YOU'RE CONSIDERING...		
adding 32MB of EDO RAM	adding 32MB of SDRAM-66	adding 32MB of SDRAM-100
BEST FOR		
Pentium classic and most Pentium MMX PCs with 16MB or 32MB of RAM	Pentium MMX and most Pentium II PCs	new Pentium II and AMD K6-2 systems
STREET PRICE		
$70-$85	$60-$90	$60-$90
TIME TO INSTALL		
20 minutes	20 minutes	20 minutes
DEGREE OF DIFFICULTY		
easy	easy	easy
BENEFITS		
Improved performance, especially with multiple applications running.	Lets you run memory-intensive applications, multitask without undue slowdowns, open very large documents and data files.	Performance boost (see SDRAM-66) for systems with 100-MHz buses.
GOTCHAS		
Be sure to hold any module by the edges, not by the static-sensitive contacts.	Don't try to install both SDRAM DIMMs and EDO RAM SIMMs at the same time.	Choosing the right kind of RAM can be tricky.
THIRD-PARTY INSTALLATION		
$30	$30	$30

For advice on installing RAM, see Upgrade Guide, *June, page 308, or visit PC World Online (www.pcworld.com/jun98/upgradeguide).*

POWER TO THE PROCESSOR

WANT A QUICK fix for a slow PC? Performing a CPU transplant may seem like a good idea, but it's usually not worth it.

Back when a new PC cost at least two Gs, spending $200 to $350 on a CPU upgrade was reasonable (see "Can't-Miss Upgrades," November 1997, page 142, or visit the Previous Issues section of PC World Online).

These days the option is less attractive. The old 486 and early Pentium PCs that need a new CPU most are least likely to work with it. Even if you perform the BIOS upgrade needed to make the new CPU work—or bite the bullet and install a new motherboard—you're still saddled with a small hard drive, slow RAM, and an ancient video card. With sleek new PCs selling for under a grand, overhauling your old junker is a losing proposition.

Snapshot: CPU Upgrades

IF YOU'RE CONSIDERING...	
Intel Pentium MMX OverDrive-200 kit, Evergreen MxPro-233 kit	Intel Pentium II OverDrive kit
BEST FOR	
Pentium-75 to Pentium-100 systems	Pentium Pro systems, especially NT workstations
STREET PRICE	
$200	$550
TIME TO INSTALL	
45 minutes	45 minutes
DEGREE OF DIFFICULTY	
difficult	difficult
BENEFITS	
15 to 40 percent performance boost, MMX-enhancements	Increased performance; access to MMX software
GOTCHAS	
Older PCs may not accept upgrade, misstep can ruin chip.	Expensive—new Celeron-based PCs cost less than $1000.
THIRD-PARTY INSTALLATION	
$30	$30

The best candidates for a PC brain transplant are 75-MHz, 90-MHz, and 100-MHz Pentiums whose owners can't afford a brand-new PC. But the higher up the Pentium chain you go, the less benefit you'll receive from a new CPU. And don't plan on plugging the latest Pentium II processor into your aging Pentium system. Intel's Pentium II and Celeron CPUs won't fit into the standard socket that held your Pentium or Pentium MMX processor.

CHOOSE YOUR CPU

UNDAUNTED UPGRADERS face two choices: Either buy an upgrade kit, or purchase the CPU alone. Kits such as Evergreen Technologies' **MxPro-233** ($199, www.evergreen.com) and Intel's **200-MHz Pentium OverDrive Processor with MMX Technology** ($199, www.intel.com) suit Pentium Classic systems and include everything you need for the upgrade—the new CPU, a cooling fan, a heat sink, and software for assessing and enabling compatibility with your system's BIOS. If your current CPU plugs into a Socket 5 module, you'll need an upgrade kit that includes a voltage converter, such as MxPro. You can save a few bucks by buying just the chip, but you have to purchase a cooling fan and make sure the new CPU works in your motherboard.

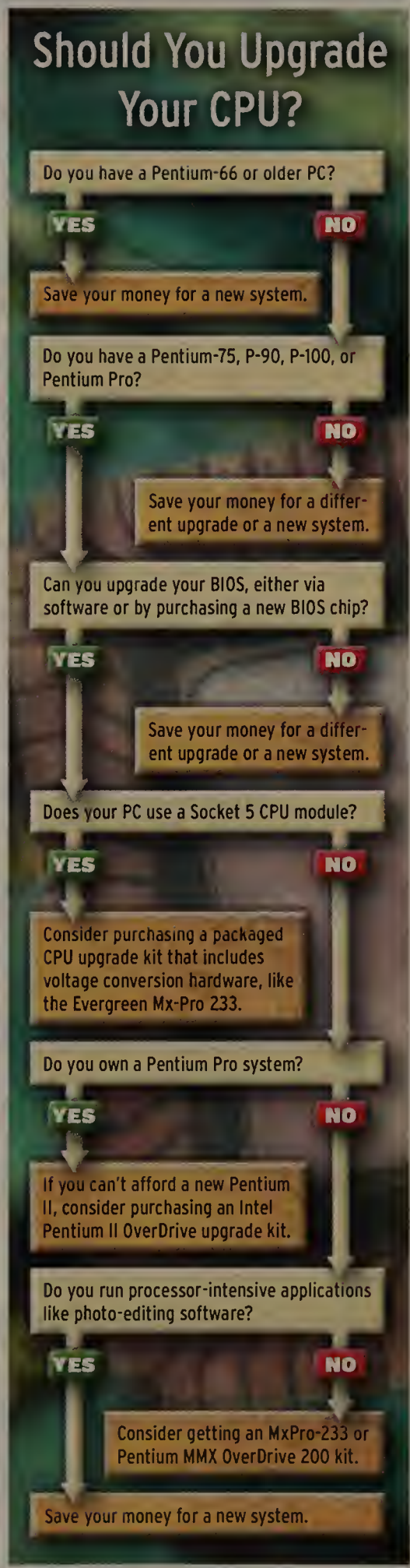
Clock speed figures mightily in any upgrade. The faster your CPU runs, the better your PC will perform. Also, look for an upgrade that enlarges the CPU's primary (or L1) cache, since this store of fast memory can help offset slower components like RAM.

If you have a Pentium Pro system, consider buying Intel's **Pentium II OverDrive Processor** for Pentium Pro PCs, which lets you boost clock speed to 333 MHz (up from the Pentium Pro's 200-MHz limit). The upgrade adds MMX instructions and the tweaked PII core for better Windows 95 performance. The bad news? The upgrade costs $550. Still, it can breathe new life into aging NT workstations and servers.

Starting in early 1999, Evergreen will offer CPU upgrades on a PCI card, which means that any computer that can accept PCI cards (including some 486-based PCs) will be upgradable to Pentium II performance. Pricing will vary, but you should be able to upgrade to a Celeron CPU with 64MB of RAM for $350 to $500.

—Michael Desmond ▶

Should You Upgrade Your CPU?



HARD DRIVE DECISIONS

OPERATING SYSTEMS LIKE Windows 98, applications like Microsoft Office, ever-expanding data files—they're all hungry for space. This means that your 2GB hard drive, which only a year ago seemed as big as Montana, now feels more like a studio apartment in Manhattan.

If you're running out of room and you have a relatively young PC, adding another hard drive is an excellent idea. And you're in luck: A new generation of big-capacity, higher-speed hard drives has arrived, and prices have never been lower. Sure, you can baby-step up to a 4GB drive for about $150, but why not take a big stride for $50 more—and give yourself plenty of expansion room for the future? At press time, 6.5GB drives such as the Seagate **Medalist Pro 6530** (www.seagate.com) occupied the sweet spot of the hard drive market, with prices starting below $200.

WIDE-OPEN SPACES

IF THAT'S STILL not enough territory, you have other options. About $200 buys an 8GB drive; and for truly hefty storage needs, manufacturers offer 10GB to 12GB drives for $250 to $350. These prices are for EIDE drives, the standard for most desktop PCs. If you want a SCSI drive, be prepared to shell out 30 to 50 percent more, plus an extra $100 to $200 for a controller. But be aware that most garden-variety desktop office applications won't register much performance difference with SCSI. It shines for use with disk-intensive specialized applications such as heavy-duty graphics, or with network file servers.

Installing a new hard drive is among the most popular upgrades, and a useful investment for most PCs. But be realistic: There's little point in upgrading if your PC runs on a 486 or one of the early Pentium processors, because these chips can't keep up with the fast flow of data from the latest generation of hard drives, essentially canceling out the drives' speed advantages. If that's your situation, it may be time to invest in a whole new system.

If you decide in favor of a hard drive upgrade, take a good look at your experience and expectations. If you're new to computers, if you quickly become impatient with mechanical matters, or if you're all thumbs, consider paying a computer dealer to do the job (usually $50 to $75 extra). On the other hand, if you're comfortable with PCs, installing a new hard drive isn't an unreasonable job. Today's hard-drive upgrade kits come with step-by-step instructions, mounting hardware, and cables. They even have software that largely eliminates incompatibility problems with older systems and automates the chore of transferring your precious data from the old drive to the new one.

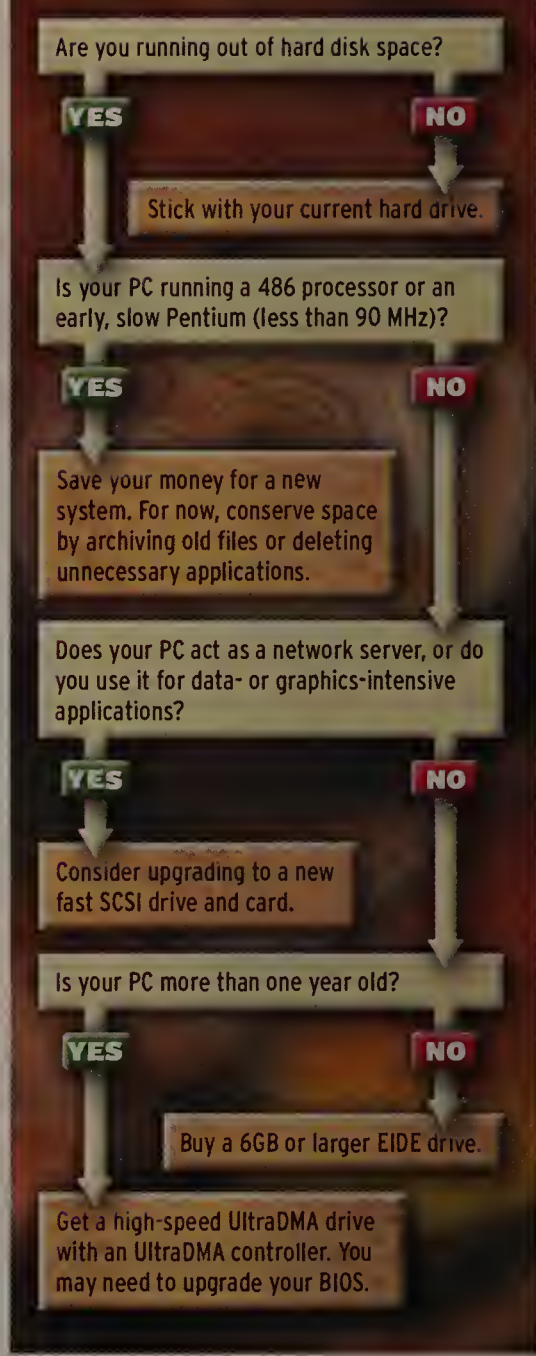
If your PC is less than a year old, it probably has a built-in UltraDMA interface, sometimes called UltraATA or AT-4, which provides maximum performance with today's UltraDMA drives. You can plug an UltraDMA drive into a standard EIDE interface—common in PCs made in the last three to four years—but you won't get maximum performance from it. Older PCs will need a BIOS upgrade before they'll handle an UltraDMA at all; check with your PC maker. If your PC doesn't have a UltraDMA interface (check your manual), an add-in UltraDMA card (about $60 to $80) will enable you to make the most of your new drive.

—Stan Miastkowski ▶

Snapshot: Hard Drive Upgrades

IF YOU'RE CONSIDERING...	
SCSI 4.5GB hard drive and SCSI card	EIDE 6.5GB hard drive and UltraDMA controller
BEST FOR	
users of apps that use large data files; high-end systems, network or Web servers	anyone who works with Windows 95, 98, or NT and is running out of space
STREET PRICE	
$400 for hard drive, $100-$200 for SCSI card	$200, plus $60-$80 for optional UltraDMA controller if your PC's more than a year old
TIME TO INSTALL	
3 hours	2-3 hours
DEGREE OF DIFFICULTY	
moderate-difficult	moderate
BENEFITS	
faster multitasking, server performance	lots of storage space, improved performance
GOTCHAS	
Drives cost more than EIDE equivalents and are trickier to set up.	Be careful to specify the correct drive when you format, or you'll wipe out data.
THIRD-PARTY INSTALLATION	
$50-$75	$50-$75

Should You Upgrade Your Hard Drive?



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CD VS. DVD

THESE DAYS, everybody's a disc jockey. If you want to install Microsoft Office 97, play You Don't Know Jack, or simply listen to Beethoven's Ninth while you work, you need to spin discs. For most of us, that means using a CD-ROM drive. But if you want to watch movies on your PC, burn your own discs, or prepare your system for the next generation of software, you need to upgrade your drive.

Your system probably already has a CD-ROM drive that runs at 4X speed or faster, and you may be tempted to move up to a cheap 32X or 40X drive. But guess what: Virtually all CD-ROM titles are written for 2X or 4X drives, so getting a faster device won't affect application performance. The only good reason to install a new CD-ROM drive is that your old one has died and you don't have the money, time, or desire to install a DVD-ROM drive in its place. An inexpensive 32X CD-ROM drive can cost as little as $50 and gives you a way to spin discs until you buy a new computer, which will likely come with a DVD device installed.

DVD-ROM IS THE FUTURE

IF YOU BOUGHT your Pentium in the last two years or so, it's a lot smarter to spend $200 to $350 on a DVD-ROM drive, which can read your old CDs as well as DVD movies, games, and more. True, few DVD titles have appeared other than movies and a handful of multimedia titles, but as new computers continue to ship with DVD drives, that will change.

DVD upgrades generally come in a kit, like the $349 **Sony DDU220E/H** (www.sony.com), which includes an MPEG 2 decoder card for playing back DVD video. The decoder card is a must-have, even though it adds about $100 to the cost of most drives, because the alternative is software-based MPEG 2 decoding, which produces herky-jerky video on anything less than a Pentium II-350. (And even on a Pentium II-450, you'll see jerkiness if you do something else while a DVD movie is playing. So unless your computer already has MPEG 2 hardware built in, go ahead and get a kit that includes a decoder card.) Keep in mind that installation can be difficult: With a decoder card and a DVD-ROM drive, the drivers for both of them, and a sound connection to make between the MPEG card and your sound card, installation involves a lot of potentially frustrating variables.

ROLL YOUR OWN DISCS

IF YOU WANT a drive that lets you store data on the discs as well as read them, the situation gets even more complicated. Anyone thinking about creating or distributing music, graphics, video, or software should consider buying a CD-R or a CD-RW drive. Both let you burn 500MB CD-R discs that will play in any CD-ROM drive—that's right, you can master your own music CDs. CD-RW drives also let you erase and reuse data on special rewritable discs. The discs cost more—about $20 each, versus $5 for CD-R discs—but because you can reuse the CD-RW discs, they warrant the added expense. In the past year, CD-RW drives like the $399 **Hewlett-Packard CD-Writer Plus 7200I** (www.hewlett-packard.com) have dropped in price to CD-R levels ($350 to $650), leaving little reason to purchase a CD-R drive (see "Cut Your Own CDs," June).

But even the 500MB of storage a CD-R disc offers isn't much these days. For maximum removable storage, you could spend $400 to $800 for a DVD-RAM drive, which will store at least 2.6GB per cartridge. There's only one problem: a DVD-RAM cartridge won't play in any device other than a DVD-RAM drive. And DVD-RAM drives can't write data to other media—though they can play CD-ROMs, CDs, and DVDs. So if you buy a DVD-RAM drive or one of its variants, don't count on using those cartridges in any drive but your own—you can't just slip a cartridge in your pocket and expect to pop it into a DVD-RAM drive at your destination. To confuse matters further, the DVD-RAM standard has competition—chiefly DVD+RW, a 3GB standard that's backed by Hewlett-Packard, Philips, and Sony. If you don't need the extra storage right now, stick with a CD-RW drive until the one of the competing DVD-RAM standards emerges definitively on top.

—Eric Knorr

For advice on installing a DVD-ROM drive, see Upgrade Guide, *July, page 310, or visit PC World Online (www.pcworld.com/jul98/upgradeguide).*

Snapshot: CD-RW and DVD Upgrades

IF YOU'RE CONSIDERING...		
DVD-ROM drive	CD-RW drive	DVD-RAM drive
BEST FOR		
owners of Pentium-133 or faster PCs	people who want to create and change their own discs, for storage and music	anyone who needs lots of rewritable storage
STREET PRICE		
$200-$350[1]	$350-$650	$400-$800[2]
TIME TO INSTALL		
60 minutes	45 minutes	45 minutes
DEGREE OF DIFFICULTY		
high	moderate	moderate
BENEFITS		
Plays DVD movies and prepares your PC for future software.	Writes and reads 500MB CD-R (write-once) and CD-RW (erasable) discs.	2.6GB to 5.2GB of rewritable storage[3]
GOTCHAS		
Can be difficult to install.	Make sure you use current drivers; can't connect second drive to sound card.	Competing standards may mean your drive will be as useful as a Betamax VCR one day.
THIRD-PARTY INSTALLATION		
$50-$90	$50-$70	$60-$70

[1] Price includes MPEG 2 decoder card.
[2] MPEG 2 decoder card not included.
[3] Capacity depends on type of rewritable DVD drive.

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SNAPPY GRAPHICS

UPGRADING YOUR VIDEO board is another idea that sounds good until you take a closer look. The reality: If your graphics card is less than two years old and you have little interest in games, digital photographs, capturing video, or watching TV on your PC, replacing your card is probably a waste of money. With ordinary applications—word processing, spreadsheets, Web surfing, even presentation graphics—you probably wouldn't notice the difference between the fastest card and the slowest.

FIND THE RIGHT CARD

STILL, FOR SOME people, the right graphics card can make a big difference. If you view or edit digital photographs, for example, you should have a graphics card with enough memory to display 24-bit color at your preferred resolution.

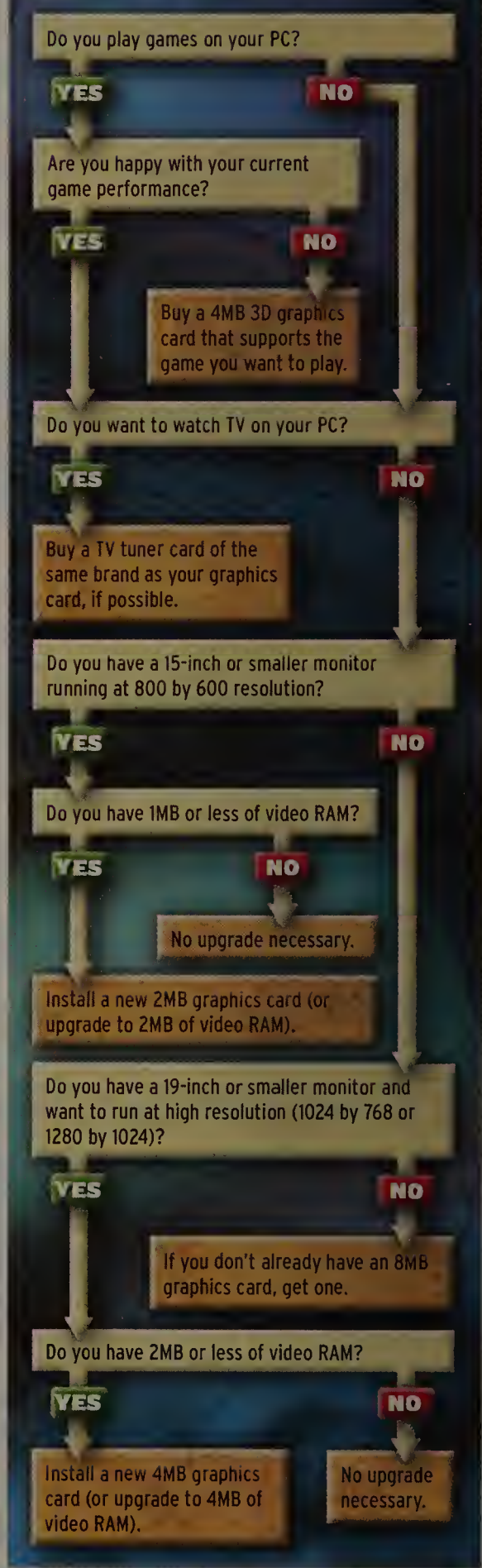
To determine how much memory your graphics card has, pay close attention while your computer is booting up—the graphics card BIOS will display the amount. If you want to run at a resolution of 800 by 600, you need at least 2MB of video memory to produce 24-bit color; for higher resolutions (1024 by 768 or 1280 by 1024), 4MB should suffice. An 8MB card will take you all the way to 1600 by 1200, a resolution used almost exclusively by CAD or graphics pros working with 21-inch or larger monitors. Extra RAM that isn't used to display images may yield a slight speed benefit because of better caching. Nearly all new graphics cards, like the $99 **STB Velocity 128** (www.stb.com; see *Top 10 Graphics Boards* in this issue) have at least 4MB of video memory, and many, like the $95 **ATI Xpert@Play 98** (www.atitech.com), come loaded with 8MB.

You can upgrade the video RAM on most types of graphics cards, but buying a new card with more memory usually makes more sense, especially if your current card is more than two years old. Card manufacturers frequently inflate the ▶

Snapshot: Graphics Board Upgrades

IF YOU'RE CONSIDERING...		
adding 2MB or 4MB of video RAM	4MB-8MB 3D graphics card	TV tuner card
BEST FOR		
technically accomplished users who can find a good price	people who want to view or edit digital photos, use graphics apps, or play games	people who want to watch TV on the PC
STREET PRICE		
$30-$150	$75-$250	$100-$175
TIME TO INSTALL		
30-60 minutes	25 minutes	30 minutes
DEGREE OF DIFFICULTY		
high	moderate	moderate
BENEFITS		
more colors, possible speed increase	increased speed, more colors, greater detail in 3D games	TV on your PC, video capture
GOTCHAS		
Tricky installation; buying a new card can be cheaper.	If you're a gamer, make sure your card works with your game of choice.	Try to buy your TV tuner card from the manufacturer of your graphics card.
THIRD-PARTY INSTALLATION		
varies, depending on card	$40	$40

Should You Upgrade Your Graphics Card?



"PalmPilot, beware."

- The Baltimore Sun

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	Everex Freestyle	Palm III™
Operating System	Windows CE 2.0 - familiar Windows interface which is instantly recognizable to Windows 95 / 98 users and provides seamless desktop integration	Palm OS
Screen Resolution	240 x 320 pixels per inch	160 x 160 pixels per inch
RAM	4 / 8 MB (Upgradable)	2 MB
Backlight	Yes	Yes
One-handed Navigation	Yes	No
CompactFlash Slot	Yes - support for Memory cards (up to 48 MB) Wireless communication Bar Coding, etc	No
Voice Recorder	Yes	No
Infrared Port	Yes - industry standard IRdA Port allows Freestyle to "beam" info to any device (notebook computer, network printer, lor PDA) equipped with standard IRdA	Yes - but proprietary IRdA allows you to communicate only with another Palm III
Vibrating Alarm	Yes - allows for silent notification of appointments	No
Digital Ink Recognition	Yes - allows you to store notes and drawings in your own handwriting.	No
MobileCradle	Yes - a foldable cradle that provides an additional battery compartment for the Freestyle while traveling.	No
Integrated 33.6 Fax / Modem	Yes - housed in the MobileCradle on the Freestyle Executive	No

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12. Please make a copy of the completed rebate form and sales receipt to retain for your records

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BYTE

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price of their own memory upgrades. If you're lucky enough to find compatible third-party memory at a reasonable price, installing it without bending pins or damaging sockets can be a challenge, and using it may void your warranty. Only technically savvy users who can find a reasonably priced upgrade should take this route. If this isn't you, bite the bullet and purchase a new card.

IMPROVING YOUR IMAGE

GAMERS STAND TO gain the most from buying a new graphics card. That's because developers optimize games for specific 3D graphics card chip sets (the processors chiefly responsible for calculating 3D perspective and blasting pixels onto the screen). The type of chip set affects not just speed but also the richness of 3D image detail. Currently, cards with Voodoo2, Savage3D, NVidia RIVA, and Intel 740 chip sets seem to perform best. But you should first find the games you want to play, then choose a card that contains a chip set supported by those games.

A couple of general tips for graphics and upgrading. First, most newer computer systems have both an Accelerated Graphics Port slot and a PCI slot—so by all means, take advantage of the faster slot and choose an AGP card, like the $149 **Matrox Millennium G200** (www.matrox.com/mga; see *Top 10 Graphics Boards* in this issue). Second, as a regular practice (even with a new card), check the manufacturer's Web site and see whether a more recent driver is available for downloading. Newer drivers often deliver better performance—and they fix bugs, decreasing the likelihood of occasional system crashes.

Finally, if you want to watch *Buffy the Vampire Slayer* on your PC, you'll need to add a TV tuner card, which can also capture video to disk for editing, posting on a Web page, or attaching to an e-mail. You'll get better results if you have at least 4MB of video memory and buy a tuner card from the same company that made your graphics card. Better yet, get one that combines graphics and tuner on a single card, like the $169 **ATI All-in-Wonder Pro**. You can search closed-caption text for keywords, save a closed-caption transcript to a text file, capture minivideos for fun, or watch *Buffy* in a little window.

—Eric Knorr

For advice on installing a graphics card, see Upgrade Guide, *February, page 308, or visit PC World Online (www.pcworld.com/feb98/upgradeguide).*

THIS YEAR'S MODEM

CABLE MODEMS, ASDL, and other neat new technologies on the horizon promise quick-as-thought Web surfing. But unless you live in one of the few major metropolitan areas where these services are currently being tested, don't hold your breath waiting for Net nirvana. Most Internet users, especially those in rural areas, will be limited to POTS (plain old telephone service) for the foreseeable future.

BUY A NEW ONE

IF YOU'RE TIRED of twiddling your thumbs while your 28.8- or 33.6-kbps modem crawls along, it's definitely time to upgrade to 56 kbps. Fortunately, the two competing 56-kbps modem technologies (K56flex and x2) have merged into a single standard, called V.90, to which Internet Service Providers are slowly but surely converting.

Unfortunately, upgrading your existing 28.8 or 33.6 modem can be tricky. Some modem makers offer do-it-yourself V.90 upgrades, which usually require changing a couple of chips, or they have a trade-in program that lets you purchase a new V.90 modem at a reduced cost. But these programs are dying out as V.90 modems—like all other PC hardware—keep dropping in price.

Our recommendation: Donate your old, slower modem to a school or charitable organization, and splurge on a brand-new one. Prices of internal V.90 modems begin at about $80, external units like the **Diamond Multimedia SupraExpress 56** at about $100 (www.diamondmm.com; see *Top 10 Modems* in this issue). Installing a new external modem is fairly easy, but swapping out an internal modem takes a bit more work. If you'd rather not deal with the installation, your local computer dealer will do it, usually for $40 to $60.

If you already own a K56flex or x2 modem, you can probably upgrade to the V.90 standard for free by downloading some software from the modem manufacturer's Web site; the software performs the upgrade by reprogramming a chip in your modem. A caveat, though: Make certain that your ISP supports V.90 before you take this step. After the upgrade, some modems aren't backward compatible with K56flex or x2. If your ISP already works fine with your modem, stay put: There's no advantage in upgrading to V.90 if you don't need to. V.90 compatibility varies by manufacturer and model; check your modem maker's Web site.

—Stan Miastkowski ▶

Snapshot: Modem Upgrades

IF YOU'RE CONSIDERING...
V.90 modem
BEST FOR
owners of 33.6-kbps and slower modems who want more speed and reliable ISP connections
STREET PRICE
internal $80–$150 external $100–$200
TIME TO INSTALL
15–30 minutes (external); 1 hour (internal)
DEGREE OF DIFFICULTY
easy (external); moderate (internal)
BENEFITS
faster downloads, more reliable connections, extra features (depending on model) such as fax, voice mail, or speakerphone
GOTCHAS
If you live in a rural area, you might not see any speed improvement. Before upgrading, make sure your ISP supports the new standard.
THIRD-PARTY INSTALLATION
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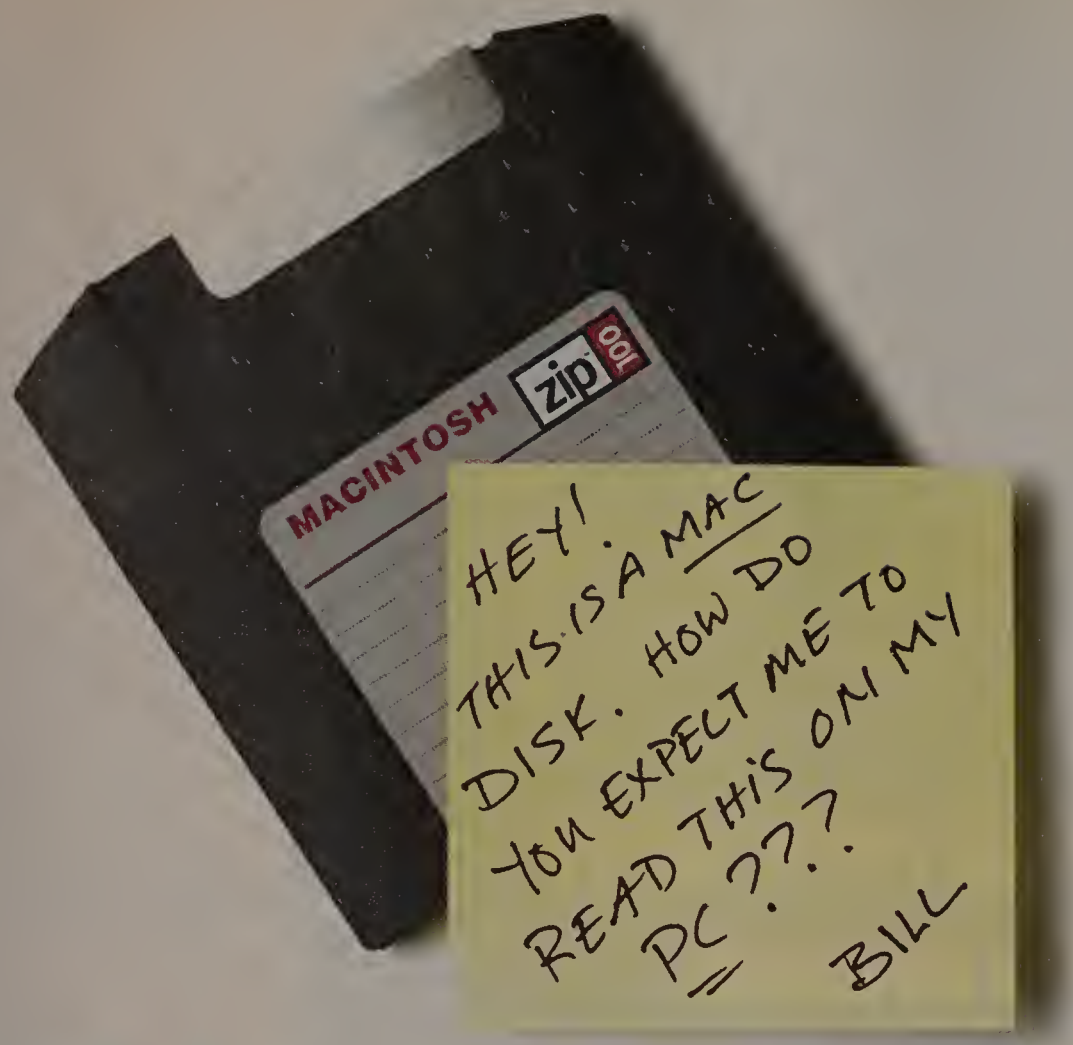

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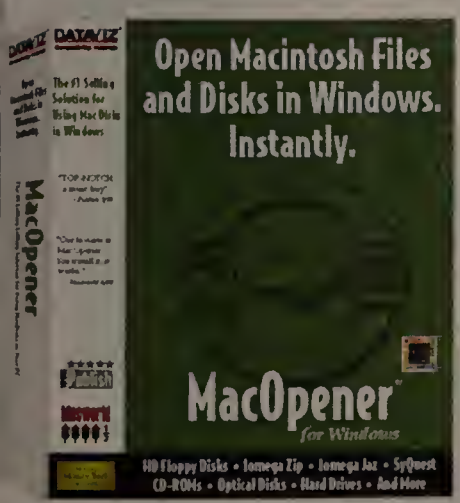

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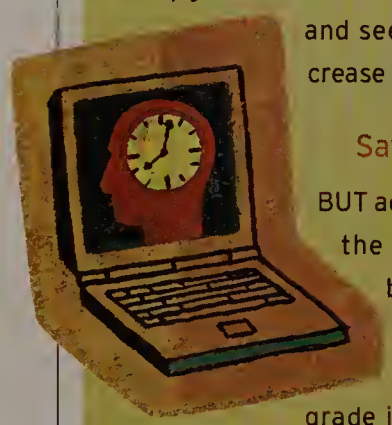
Portable Upgrades—Think Twice

IF YOU'RE HOPING there's a faster future for your trusty portable, dream on. Though processor, RAM, and drive upgrades are available for some laptops, these enhancements are slower, smaller, and more expensive than their desktop equivalents.

The most cost-effective upgrade for notebooks, as for desktops, is an infusion of supplemental RAM, especially if your portable currently carries 16MB or less. You can upgrade 8MB to 32MB for $70 to $135 and see a noticeable increase in performance.



Save Your Money

BUT adding RAM may be the *only* upgrade to boost notebook performance. A hard drive upgrade is costly and may not add speed. Expect to pay $375 to $450 for a 3GB drive.

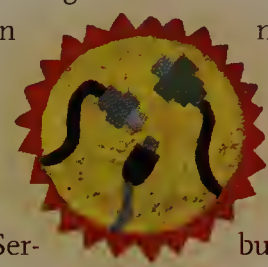
CPU upgrades are limited primarily to 486-based systems. For about $300, you can replace your laptop's 486 processor with a considerably faster 100- or 133-MHz Pentium clone. But factor in the necessary RAM and hard drive upgrades, and you've already spent almost as much as you'd pay for a brand-new low-end 200-MHz Pentium portable, such as the $400 Acer Extensa 367D (www.acer.com). And of course, your laptop's display and video chip are there to stay.

The landscape is changing—today's laptop is much more upgradable than last year's model. Many notebooks feature drives that pop in and out, come stoked with 64MB or more of RAM, and use one of Intel's upgradable mobile Pentium processors. Someday you may be able to pop out your current portable's PII-266 and plug in something faster. However, it'll never be as fast as the latest laptop on the block. So save your upgrade money for next year's bargain notebook.

—Scott Spanbauer

PUMPED-UP PORTS

IT'S NOT ENOUGH to keep your PC running smoothly—you've got to keep its friends happy, too. If you own a digital camera, a scanner, and/or an external storage device, you have a problem: too many gadgets, not enough ports. The solution: Add some fast ports.



Luckily for you, the Universal Serial Bus is finally in the express lane, SCSI is still going strong, and lightning-speed 1394 connections are just around the corner.

WHAT SPEED DO YOU NEED?

FIRST THOUGH, you need to consider how much juice you need. Many of the latest desktop video cameras, digital still cameras, and lower-resolution scanners require a USB port. If you bought a computer in the last year or so, you probably have two open USB ports, each of which can move 12MB of data per second (absolutely whizzy compared to your parallel port's 1.2 MBps). It's time to use them. If you're working with an older PC, you need to teach it some new tricks. USB upgrade kits are downright cheap. A two-port $40 **PCI-4U USB** upgrade kit from Entrega Technologies (www.entrega.com) slides into a free PCI slot on a Windows 98 system.

To accommodate a device that sucks up more bandwidth, like an external drive or a high-resolution scanner, USB won't cut it—you need a SCSI connection. SCSI 2 (the most common type of SCSI connection) is two to three times faster than USB. For users who don't already have a SCSI connection, many peripherals ship with an add-in SCSI card. Be warned, though, that a bundled SCSI card may not conform to the latest specs, which can make for tricky installation and spotty performance with SCSI devices other than the one it came with. You may be better off buying a SCSI card on your own (prices begin at about $75).

SCSI's extra bandwidth is a plus, but SCSI devices are costlier and more difficult to install than USB equipment. A new bus system called 1394 (aka FireWire) promises to give both SCSI and USB technology a run for your money. The 1394 bus will allow users to add multiple devices without having to tweak and reboot the system. It will also move data more than 16 times faster than USB. Adaptec currently sells a combination 1394/SCSI PCI card for $699 (www.adaptec.com), but if you buy it now, you'll be able to use the 1394 connection with only a handful of digital camcorders. Over the next few years, prices will drop and 1394-compliant scanners, hard drives, and other peripherals will become available.

—Angela Navarrete

Michael Desmond, Stan Miastkowski, and Scott Spanbauer are PC World *contributing editors; Angela Navarrete is a* PC World *staff editor. Eric Knorr is a freelance writer based in San Francisco.* ■

Snapshot: Fast Port Upgrades

IF YOU'RE CONSIDERING...	
USB upgrade kit	adding SCSI adapter card (PCI)
BEST FOR	
anyone with Windows 98 and a hankering for multiple peripherals	anyone seeking better performance from their peripherals
STREET PRICE	
$30-$50	$75-$250
TIME TO INSTALL	
30-60 minutes	2-3 hours
DEGREE OF DIFFICULTY	
easy	moderate-difficult
BENEFITS	
faster performance, attaches multiple devices	fast, stable performance for high-end peripheral like storage or hi-res scanner
GOTCHAS	
Possible performance dip when multiple peripherals use the same USB connection.	SCSI devices can be tricky to install; be sure to follow directions carefully.
THIRD-PARTY INSTALLATION	
$45	$45

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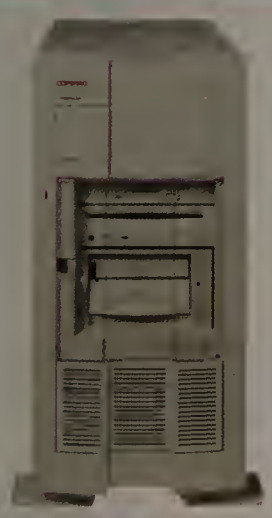

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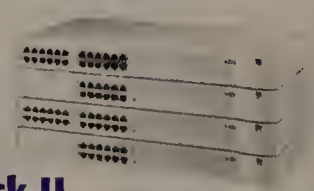

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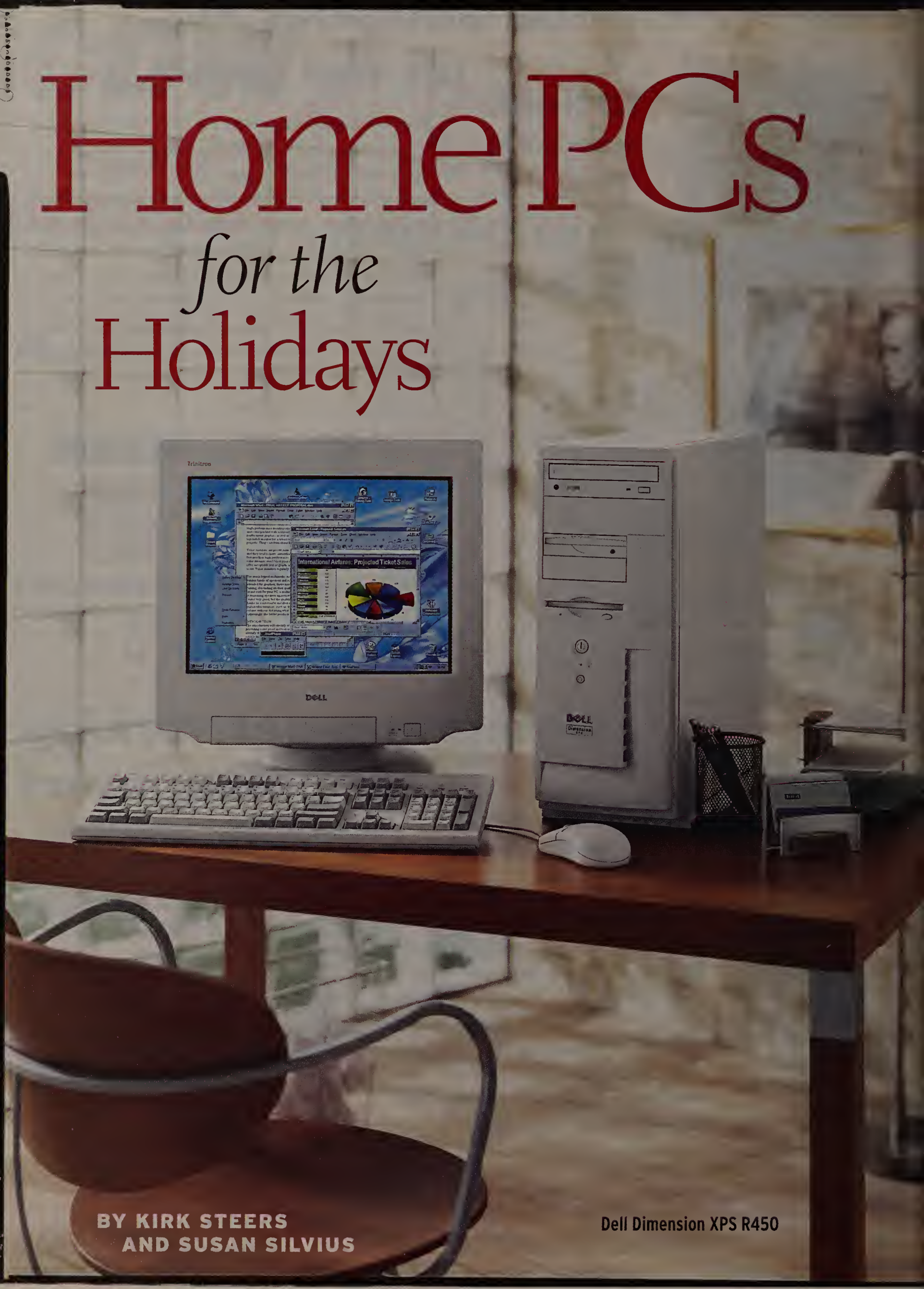
Home PCs *for the* Holidays

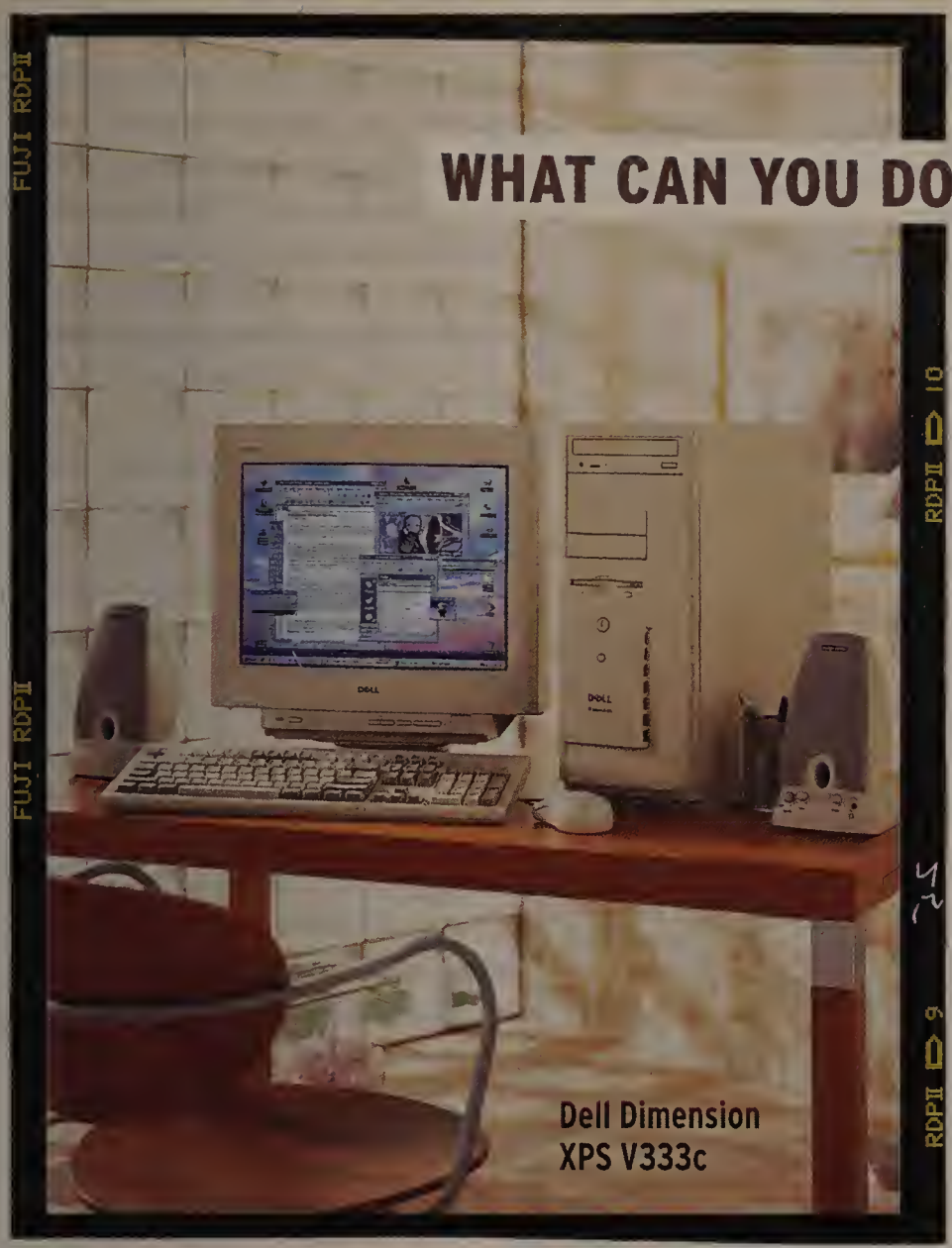


BY KIRK STEERS
AND SUSAN SILVIUS

Dell Dimension XPS R450

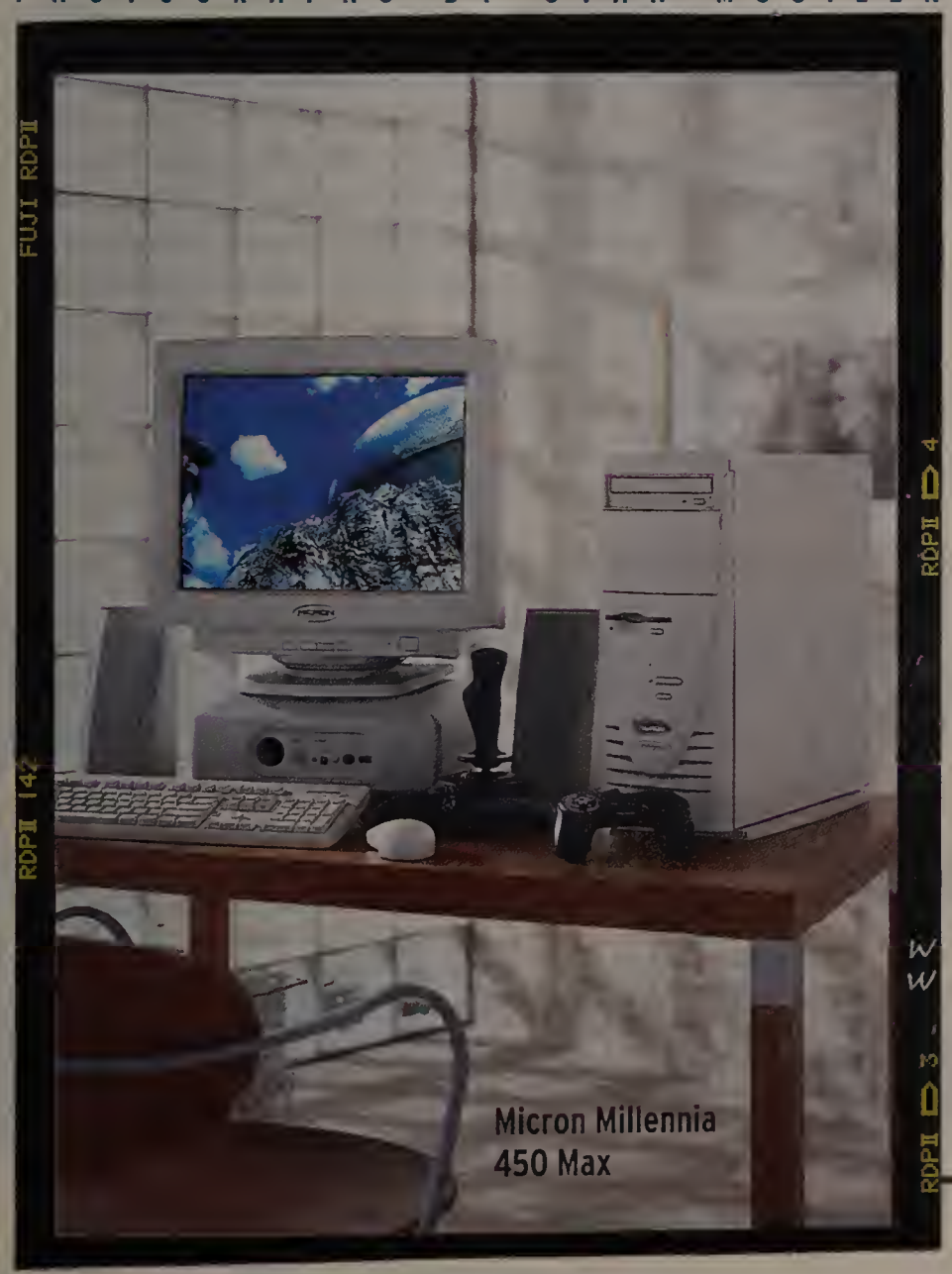
14363
BE DJHE
FUJIFILM RDPII

WHAT CAN YOU DO WITH YOUR COMPUTER AT HOME THAT YOU CAN'T DO WITH YOUR PC AT WORK?



Dell Dimension XPS V333c

PHOTOGRAPHS BY STAN MUSILEK



Micron Millennia 450 Max

ANYTHING YOU WANT. With no IS department looking over your shoulder, telling you what you can and can't have on your PC, you decide. You can load it with games, wallpaper, screen savers, shareware, applications, and whatever else tickles your fancy. No one monitors what's on your system or requires you to change your network password every month: At home, you are the administrator.

What's more, you can pick the exact PC you want—unlike at work, where woefully outdated, underspecced, one-size-fits-all systems are the norm. The home PC market is wide and varied, from bargain-basement models like IBM's Aptiva E2N with its AMD K6-266 processor, at a little over $1000 to fully stocked powerhouses like the Micron Millennia 450 Max, with its lightning-quick Pentium II-450, powerful graphics card, and imposing $2899 price tag. The challenge for you, the buyer, is to figure out how much PC you need.

13 SYSTEMS REVIEWED

IF THE PC FITS...

THE BEST COMPUTER for one home user isn't necessarily the best for another. If all you plan to do is surf the Web, create spreadsheets, and write text documents, a $3000, 450-MHz system with 128MB of RAM is overkill. Whatever your home needs, you'll find a suitable system here: Prices of PCs reviewed for this article range from $1048 to $2899 for complete systems, including monitor.

With the holidays here, who has the time to look for a PC with just the right price, performance, configuration, and reputation for reliability? Actually, we do.

To make it easier, we divided home computers into three categories, based on the primary use for which each is designed. And after examining 22 PCs (from 16 vendors), we picked the 13 best—5 home office, 5 family, and 3 gaming.

A good home office PC moves fast, has lots of storage space, and carries a solid features set—maybe a Zip drive, a good 17-inch monitor, and (usually) a bundled software productivity suite. Some home office systems—such as Gateway's GP6-450—include an ethernet connection to use with a cable modem or a home network. Their graphics and multimedia capabilities are more attuned to home business use than to leisure use. Systems in the home office category scored well in our 2D graphics testing of Macromedia Director with video playback in the background. Prices of the top five home office PCs start at $1649 and top out at $2729. ▶

In contrast, family systems are typically entry-level PCs destined for less-demanding tasks like Web browsing, e-mail, home finance, and edutainment. Performance on 3D games is relatively poor, thanks to the older, slower graphics cards, chip sets, and CPUs employed to cut costs. Speakers, monitor, and other components tend to be of lower quality, too. All our chart-making family PCs cost less than $1550.

One family system, HP's Pavilion 6350, did not run during testing. We tried to test two identically configured PCs, but both exhibited the same problem. According to Hewlett-Packard, a bug in the keyboard's firmware causes the <Shift> key to stick electronically, rendering the mouse and keyboard useless on these early production units. If you have experienced mouse and/or navigational problems with a Pavilion 6330, 6340, 6350, or 8360, phone HP at 208/323-4663, and it will send you a new keyboard at no cost. We couldn't obtain a new keyboard in time for this story.

What makes a good gaming PC? Speed, high-quality audio and video, a top-tier graphics card for demanding 3D games, a joystick or game pad, and popular gaming titles. Performance is paramount in this group: All three chart makers carry a 450-MHz processor. In a home office, these stocked systems can create attractive presentations and store lots of data. But gaming is their top priority, and predictably they roared past all other comers in our tests of three popular 3D games—Incoming, Turok, and Redline Racer. Prices on our top three gaming systems range from $2699 to $2899.

To underscore the different strengths of the three groups of systems, we weighted their test results and features differently. We rewarded home office PCs for balancing price, performance, and features. In assessing family systems, we focused on affordability, simple setup, ease of use, and good design, deemphasizing performance and features. And among gaming systems, we gave special weight to performance, graphics quality, and features at the expense of price and ease of setup.

THROUGH THE RINGER

TO PICK THE BEST home systems, we subjected these PCs to the same treatment you'd give them at home. We took each PC out of its box, stripped away the annoying polystyrene casing, connected cables from the monitor and the other peripherals to the PC, and booted up Windows. Next we auditioned the quality of the sound coming from the speakers and subwoofer, tested how well the monitor displayed text and graphic images, and evaluated DVD movie playback quality.

Then we removed the case and gauged each system's interior for expandability, organization, and sturdiness. Our ease-of-use and design scores reflect this measure. We rated graphics card performance, too, after testing all systems and their video adapters on both their 3D gaming prowess and their ability to display the 2D graphics that are more typical of a business presentation. Finally, we ran each PC through our PC WorldBench 98 test.

Features count at home, of course, so we boosted ratings of better-stocked systems. Bonuses such as large hard disks, Zip drives, 19-inch monitors, and network cards won extra points. We also evaluated software bundles and adjusted ratings based on the needs of the three groups.

You're on your own at home, so system setup and ease of use are more crucial there than at work. We awarded points for setup pluses that save time and lessen frustration—cables color-coded to their matching ports, neatly organized and well-illustrated manuals, clear paths to technical support, and tutorials that walk you through the operating system. Our ease-of-use and design ratings recognized PCs for such conveniences as a multimedia keyboard, intuitive con-

Best Buys

OUR THREE BEST BUYS represent different things to different people. Home office users will love the versatility of the $2729 Dell Dimension XPS R450, which fared well with popular home office applications like Microsoft Word and Excel but still impressed us with its ability to display graphics for 3D games. The system's rich feature set is well suited for home office users concerned with performance. Family users will be impressed by the $1529 Dell Dimension XPS V333c, which employs a Celeron-333 chip to keep the overall price down. We found the system easy to set up and use and were also encouraged by Dell's excellent record for reliability with its home systems. Gamers will love the $2899 Micron Millennia 450 Max, which dazzled us in our gaming tests with its ability to portray smooth, brilliant graphics and with its high performance scores across the board.

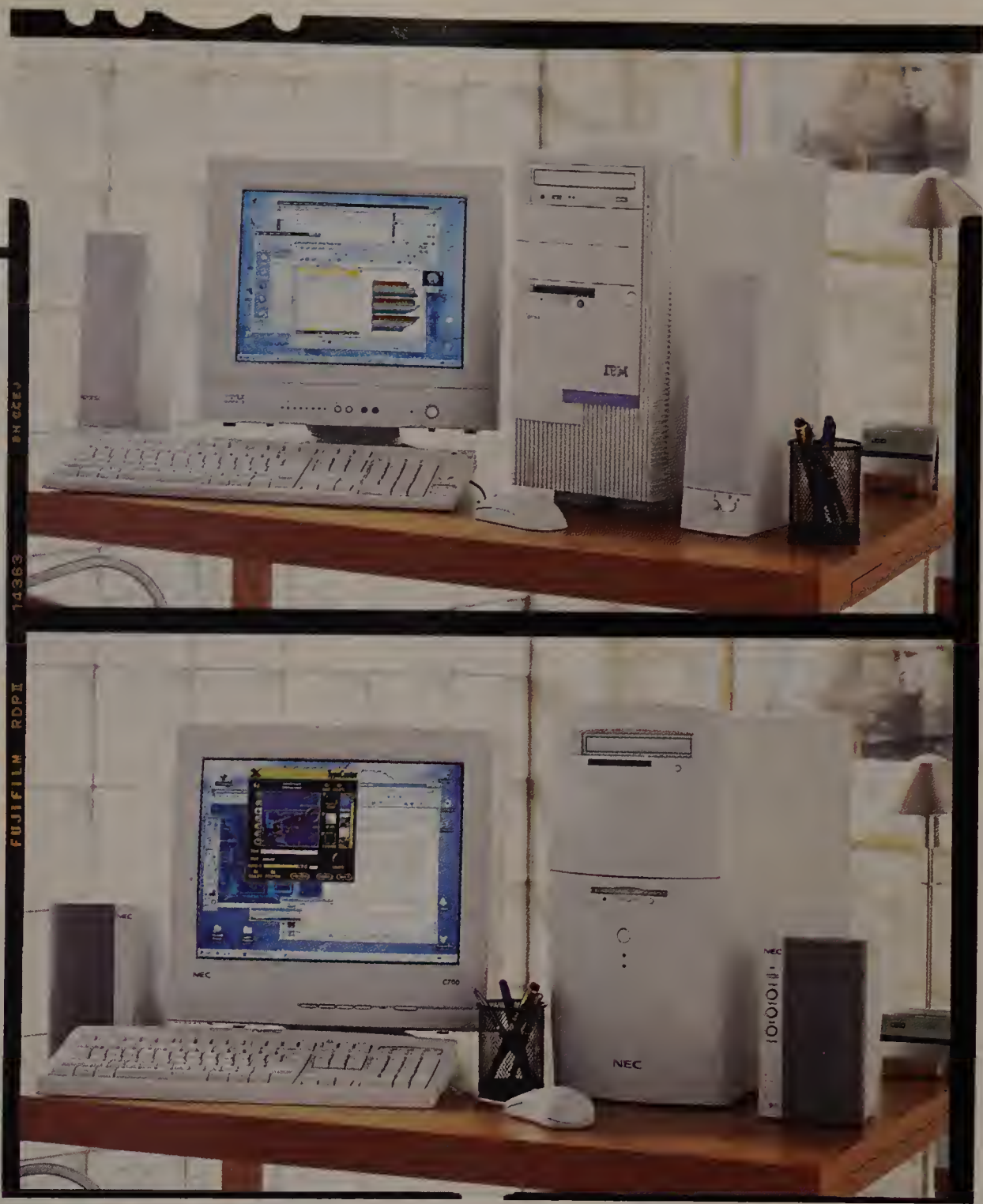
HOME OFFICE PCs

	SYSTEM	CPU	Street price (9/15/98)	Comments	InfoNet number
1	Dell Dimension XPS R450 800/388-8542 www.dell.com	Pentium II-450	$2729	PRO: Very fast on business apps and graphics, MPEG decoder, excellent reliability rating. CON: Most expensive office system on chart, limited SOHO software bundle.	700
2	Gateway GP6-450 800/846-2000 www.gateway.com	Pentium II-450	$2458	PRO: Good expandability, 19-inch monitor, network card. CON: Expensive, company's reliability rating is only fair.	701
3	NEC Ready Office 2010 800/524-0819 www.nec-computers.com	Pentium II-350	$1778	PRO: Bundled color scanner, good price. CON: Graphics performance only fair.	702
4	Micron Millennia 350 888/634-8799 www.micronpc.com	Pentium II-350	$1649	PRO: Great price, good service and reliability ratings. CON: A bit slower than the 450-MHz home office systems.	703
5	IBM Aptiva E5D 800/426-7235 www.pc.ibm.com/us/aptiva	Pentium II-400	$2048	PRO: Good reliability ratings, easy setup. CON: Relatively expensive, slow for a Pentium II-400, 15-inch monitor.	–

Best Buy

All products: 908

PRODUCTIVE POWER: The best home office systems combine impressive features and reliability, like the IBM Aptiva E5D (top), or have attractive extras such as a productivity suite and a bundled scanner (not shown here), like the NEC Ready Office 2010.



trols for adjusting the monitor and other components, easy access to the Internet, and preinstalled drivers.

RELIABILITY AND SERVICE

SERVING AS YOUR own IS department means depending not only on the reliability of a PC and its components, but also on the quality of the vendor's support. *PC World* recently conducted an all-new reader survey of company reliability and service and based 25 percent of each unit's score on these attributes (see "PC Reliability and Service: Who Can You Trust?" November, page 97).

Home Office PCs

1 Dell Dimension XPS R450

Versatility is the name of the game with the Dell Dimension XPS R450, our top-rated home office system. This all-around powerhouse delivers both vapor-trail speed and high-quality graphics; you'll find that it runs office suites, multimedia applications, and even fast-paced 3D games with equal agility.

The XPS R450's PC WorldBench 98 score of 218 makes this midtower the fastest home office PC we've seen—with plenty of strength to handle large spreadsheets, databases, or graphics files. You can expect to pay for top performance, too. At $2729, the XPS R450 is easily the most expensive home office system here.

The Dell's on-board MPEG-2 decoder—the only one in this roundup—produced the best DVD video playback score here. The system's 17-inch 1000HS monitor displayed sharp, rich colors, with impressively clear still images, DVD-based video, and fast-moving animation.

The XPS R450 delivered consistently ▶

SCORECARD

★ Overall rating	PC WorldBench 98 score/rating	Price	Ease of use and design/ setup	Graphics	Reliability/ service	Features
81	218/outstanding	expensive	outstanding/ good	outstanding	outstanding/ fair	10GB hard disk, 4.8X DVD-ROM drive, 56-kbps V.90 modem, 17-inch monitor, Zip drive, ST8 Velocity 4400 (16MB SDRAM), 3-year parts/1-year labor warranty, 24/7 tech support.
76	213/outstanding	expensive	very good/ outstanding	good	fair/ good	10GB hard disk, 13X-32X CD-ROM drive, 56-kbps V.90 modem, 19-inch monitor, integrated ATI Expert 98 (8MB RAM), 3-year parts and labor warranty, 24/7 tech support.
75	183/good	inexpensive	very good/ outstanding	fair	fair/ fair	10.2GB hard disk, 16X-32X CD-ROM drive, 56-kbps modem, 17-inch monitor, LS-120 drive, ATI Rage IIC (4MB SDRAM), 1-year parts and labor warranty, 20/7 tech support.
74	178/fair	inexpensive	good/ very good	good	good/ good	10GB hard disk, 24X-32X CD-ROM drive, 56-kbps modem, 17-inch monitor, Zip drive, integrated NVidia RIVA 128 (4MB SGRAM), 3-year parts/1-year labor warranty, 24/7 tech support.
74	185/good	moderate	good/ outstanding	good	good/ fair	8GB hard disk, 4X DVD-ROM drive, 56-kbps modem, 15-inch monitor, integrated ATI Rage Pro 2X Turbo (4MB SGRAM), 3-year parts/1-year labor warranty, 24/7 tech support.
Scorecard weightings ▶	Performance 20 percent	Price 20 percent	Design/setup 15 percent	Graphics 5 percent	R&S 25 percent	Features 15 percent

What's the fun of sampling just one

Designed for Microsoft Windows NT Windows 95 Novell

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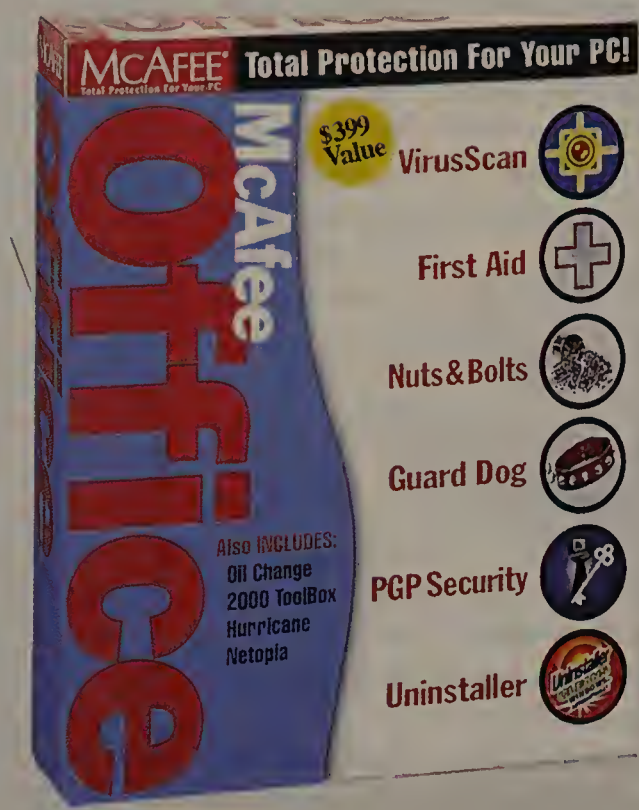
BASICALLY, IF IT'S NOT IN MCAFEE OFFICE, YOUR PC DOESN'T NEED IT. FOR MORE INFORMATION, VISIT US AT WWW.MCAFEE.COM OR CALL 800-332-9966, DEPT. 1145.



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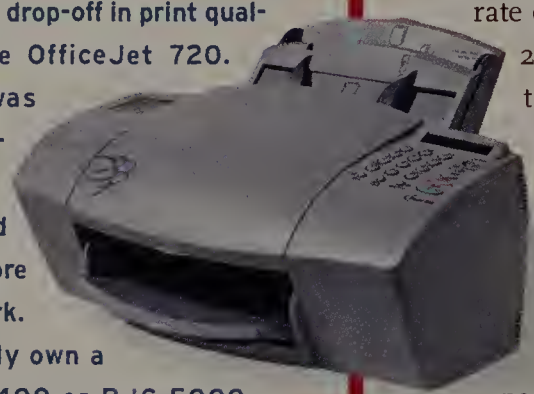
All-in-One SOLUTIONS for the Home Office

TO HELP YOU save money and space in a cramped home office, we looked at multifunction devices from Hewlett-Packard (www.hp.com; 800/752-0900) and Canon (www.canon.com; 800/652-2666).

HP's OfficeJet 720 (bottom) scans, prints, faxes, and copies—all in color. Its 600-dpi print quality is about as the best you can get without shelling out for a laser printer. At $629, the OfficeJet isn't cheap; but it's more economical than having to buy three or four free-standing machines. And since it's only as big as a typical ink jet printer, the OfficeJet saves space. Setup takes 15 minutes, from unboxing it to printing a page. The unit ships with scanning and OCR software.

Canon's MultiPass C5000 (top) offers the same capabilities as its HP rival but costs just $399. If you use special ink jet printer paper with your MultiPass, you won't see much drop-off in print quality versus the OfficeJet 720. Installation was bumpier, however. The setup program stalled on us twice before we got it to work.



If you already own a Canon BJC-4400 or BJC-5000 printer and don't need an all-in-one, check out the $99 Canon IS-22 scan-head attachment. It replaces the ink jet cartridge, turning a BubbleJet into a 360-dpi scanner. Lumina's printer-to-scanner converter does more and works with a wider variety of printers. The $249 Lumina Personal Color Copier (www.luminapcc.com; 800/600-8086, ext. 308) connects to your printer and lets you make copies; reduce, enlarge, or mirror images; and scan documents and images.

quick, smooth game play in our 3D game tests. Thanks to the NVidia RIVA 128 TNT chip set on its STB Velocity 4400 graphics card—*and* the card's 16MB of dedicated SDRAM—it outperformed all but the Micron Millennia 450 Max.

After you shuck the sturdy, easy-off case, you'll find a large well-organized interior that provides plenty of room for upgrading—three open drive bays and two open slots. Unfortunately, you won't find many extras for the home office except Office 97 Small Business Edition.

According to the *PC World* subscribers in our recent reliability and service survey, Dell's service was middle-of-the-pack, but its home systems ranked at the top of our reliability ratings. Dell PCs had an extremely low rate of component failure.

2 Gateway GP6-450

The Gateway GP6-450 is built for serious business. So serious, in fact, that it comes with an ethernet card ready to plug into a cable modem or your home network. For $50 more, you can add a modem, which we did for our review model.

With a sticker price of $2458, the GP6-450 is the second most expensive home office PC we reviewed. It carries a 19-inch monitor—great for really large spreadsheets—but no DVD-ROM drive.

The GP6-450 posted the highest frame rate of any home office PC in our 2D Director and AVI graphics test, meaning that presentations will be sharp. Its performance in 3D game tests equaled that of other home office PCs, but trailed the top-rated Dell's. The included Altec Lansing speakers are passable for listening to music, but they lack depth of bass and treble.

Gateway systems tend to be easy to set up and use, and the GP6-450 is no exception. Ports are color-coded to their corresponding cables, and documentation is terrific. Monitor and multimedia controls are intuitive, and the keyboard features programmable buttons for controlling audio and launching applications.

Expandability is no problem with the GP6-450. Even after we added an internal modem, it still had three open slots. The roomy interior of this tall midtower offers two free memory sockets when configured with 64MB of RAM, as our test unit was. You may want to get yours with 128MB installed; doubling the RAM can cost you as little as $100.

The system's three bundled software titles are all very useful in a home office. Microsoft's Office 97 Small Business Edition is complemented by Microsoft's Streets 97 and Bookshelf 98.

In our reliability and service survey, *PC World* subscribers were generally unimpressed with the reliability of Gateway's home PCs. The company fared poorly in the "Problems per year" category.

3 NEC Ready Office 2010

The NEC Ready Office 2010 is one of many systems to benefit from Intel's price cutting. This PII-350 machine's $1778 price tag is terrific for a business-oriented home PC, and as its PC WorldBench 98 score of 183 demonstrates, the Office 2010 brings plenty of power to bear on office tasks like word processing and spreadsheets. The system set up smoothly; the thorough documentation, color-coded cables, and well-thought-out instructions are excellent guides. Among the handy home office features are a built-in LS-120 floppy drive and a 600-dpi NEC 636I color scanner. The scanner is a nice extra that no other PC in this review offers.

The NEC C700 17-inch monitor captured the highest score in the entire roundup on our monitor image test, producing great detail and rich colors. The Ready Office 2010 performed well on our 2D AVI tests, too, so it should be strong at displaying presentations. But you wouldn't want to depend on this system to handle fast-moving graphics; the ATI Rage IIC chip set performed abysmally on our two 3D game tests. In fact, it was the only chart maker that failed to run Redline Racer at all. The speakers accompanying the monitor generated uninspiring sound, roughly equivalent to that of the Aptiva E5D's speakers.

The NEC comes with a useful software bundle: Peachtree's Office Accounting package; Microsoft's Word, Works, and Publisher; and Quicken Basic 98, as well as a business phone book on CD-ROM.

In our most recent reliability and service survey, *PC World* subscribers rated ▶

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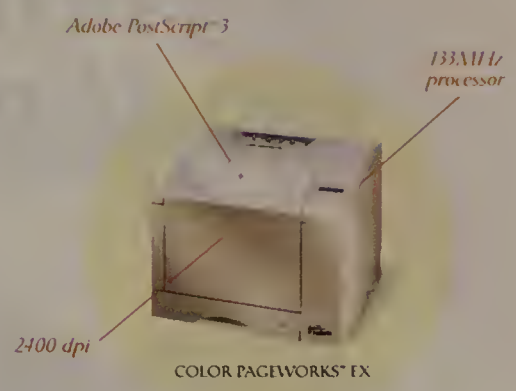

Wants vs. needs. The debate has raged for centuries. The fact is, you probably *need* speed, resolution, and Adobe PostScript® 3 more than want them. And that's the point.

What you don't need is a pricey logo. Like HP's, for example. That's more of a want. And, sorry, there's no Maslow's hierarchy of wants.

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I found the name "William Hunt Wilson" on the CD. The family tree was huge — hundreds of names! My name was not there, so I decided to contact the tree's contributor to let her know that I found the connection. I left a message, and that night, I received the long-awaited call. The contributor, who is also my cousin, was screaming on the phone because she could not believe she had found me. **I was part of a "long lost leg" that the family had not heard of for over 50 years!** We laughed, we cried, and talked all night. And now, we have contact every day — either by phone or by email.

A family reunion is scheduled to take place this Fall, thanks to Family Tree Maker. I never would have found my family if it weren't for the program.

Thank you!

Diana Yasher

San Jose, CA

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PC MAGAZINE — Top 100, 9/97

HOT LIST ComputerLife — 1996/97/98

FamilyPC — 1996/97/98

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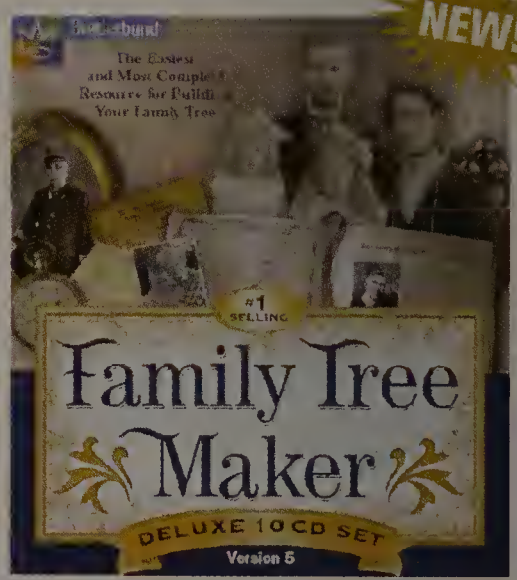
Awards won by Family Tree Maker™ Deluxe Edition III, the previous version.



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* The World Family Tree CDs contain actual family trees. Contributor information is available free upon request. Family Tree Maker is available for Windows 95 and Power Macintosh. Features vary according to platform and price. Additional accessory CDs sold separately.
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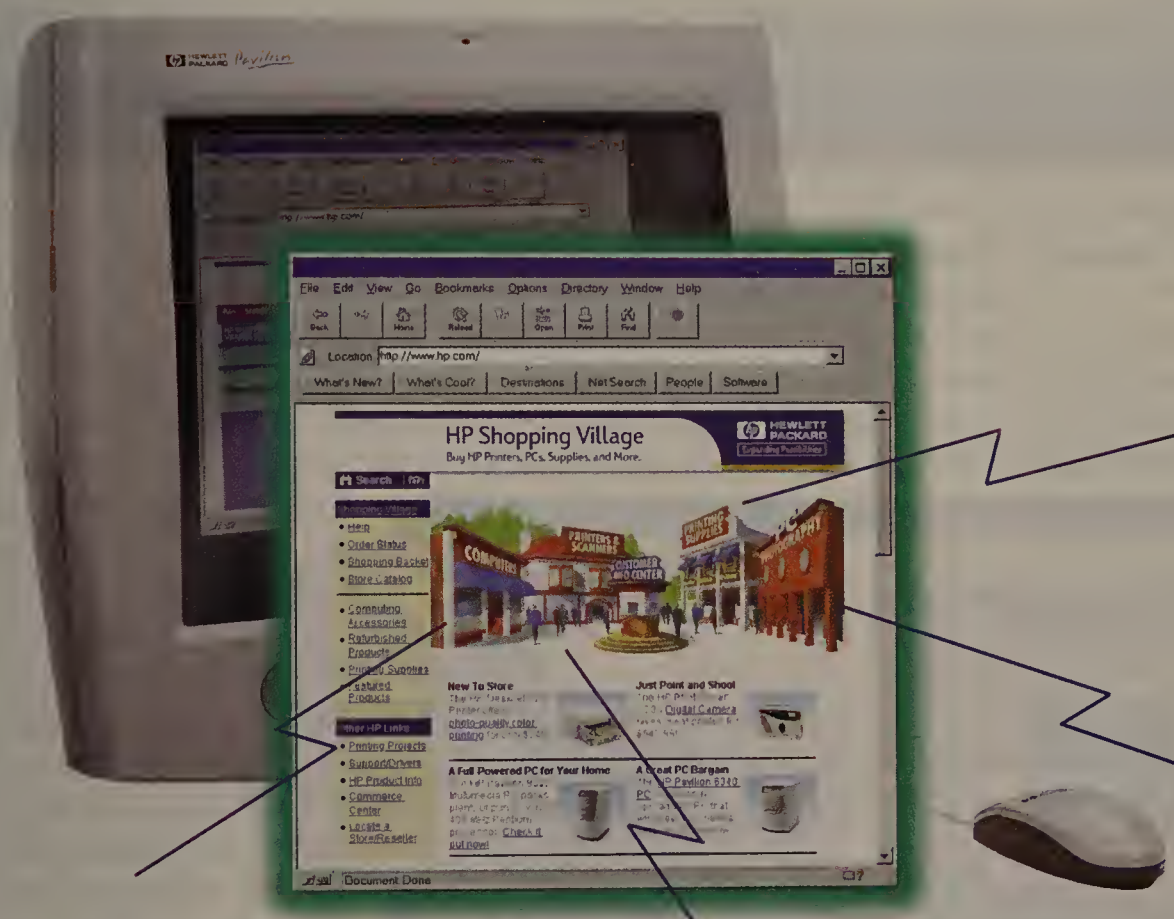

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FAMILY PCs

	SYSTEM	CPU	Street price (9/15/98)	Comments	InfoNet number
1	Dell Dimension V333c 800/388-8542 www.dell.com	Celeron-333	$1529	**PRO:** Easy setup, best home reliability ratings. **CON:** Third most expensive family PC.	704
2	Sony VAIO PCV-E204 888/315-7669 www.sonypc.com	Pentium II-333	$1549	**PRO:** DVD-ROM drive, good reliability and service. **CON:** Most expensive family system, limited upgradability.	705
3	IBM Aptiva E2N 800/426-7235 www.pc.ibm.com/us/aptiva	AMD K6-266	$1048	**PRO:** Great price and setup, good reliability ratings. **CON:** Slow, limited expandability, poor graphics.	–
4	Packard Bell Multimedia 945 800/733-5858 www.packardbell.com	Celeron-333	$1178	**PRO:** Great price, quickest family PC. **CON:** Poor sound, unacceptable service rating.	706
5	Compaq Presario 5150 800/345-1518 www.compaq.com	AMD K6-2-350	$1548	**PRO:** Well-designed exterior, Network card. **CON:** Poorly designed interior, limited software bundle.	707

Best Buy

All products: 909

NEC's home systems as average in both service support and trouble-free operation.

4 Micron Millennia 350

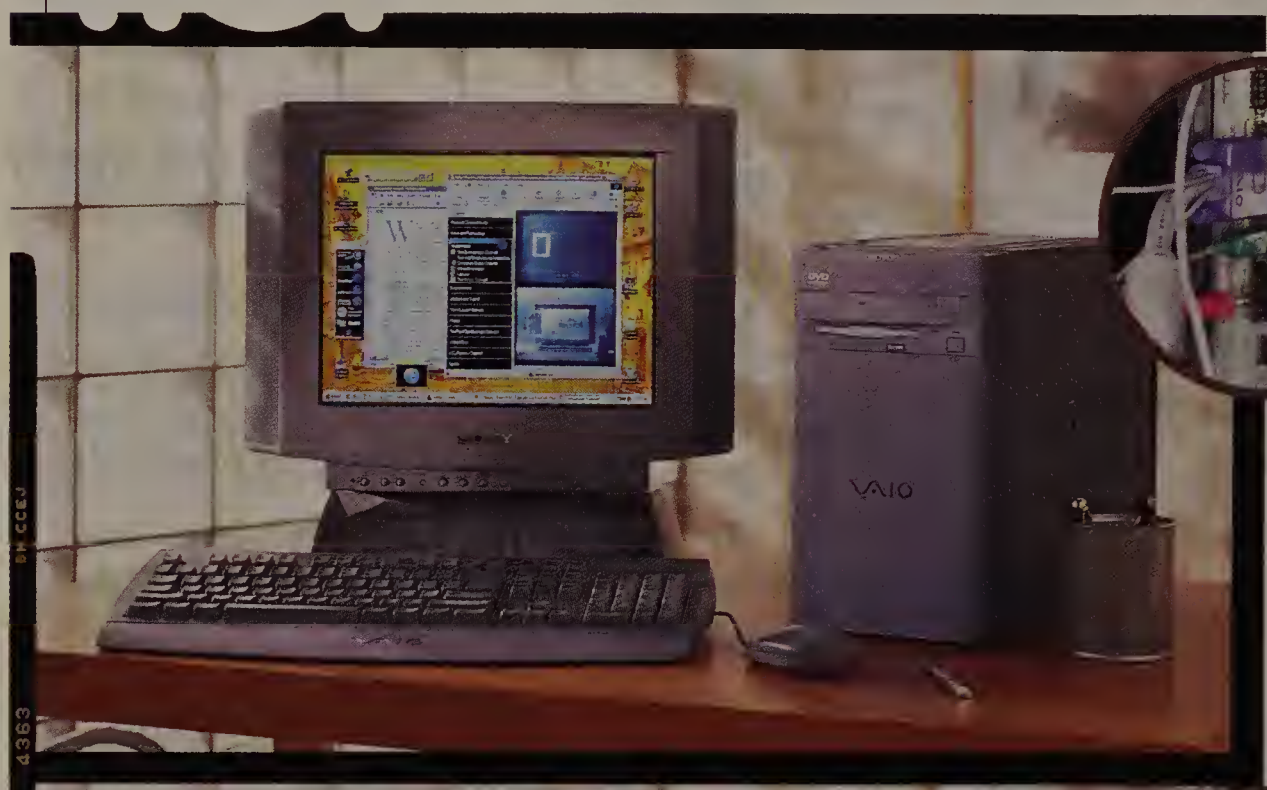
Like the NEC, the $1649 Micron Millennia 350 holds down costs by packing a PII-350 processor and 64MB of RAM. And like the NEC, it has all the processing power you need to run standard office applications like Word and Excel. Add Micron's good record for reliability and service, and you have a real bargain.

Of course, the Millennia 350 can't compete with a 450-MHz machine in pure performance. Its PC WorldBench 98 score of 178 is merely average for its processor class, and the system lacks a DVD-ROM drive and high-end speakers.

But you may not want those multimedia extras in a home-office system, anyway. The Millennia 350's graphics performance is more than adequate for handling presentations—on par with the more expensive Gateway GP6-450. The Micron's 17-inch 700VX monitor produced clear and colorful images, and it is nicely matched with an integrated NVidia RIVA chip set.

If you need to expand later on, the Millennia 350's easy-to-remove side panel provides convenient access to two free PCI slots and two drive bays. But only one of the drive bays is externally accessible.

Micron's system documentation is thorough, but the system lacks a customized tutorial to ease setup. The software bundle is limited to Norton AntiVirus and Microsoft Office 97 Small Business Edition. In our most recent reliability and service survey of *PC World* readers, the vast majority



FAMILY FURNISHINGS: The best family PCs were easy to set up and use. Many had convenient features like color-coded ports and cables, as in the Sony VAIO PCV-E204 *(top)*. The front panel on the Compaq Presario 5150 *(bottom)* houses USB and MIDI ports.

SCORECARD

★ Overall rating	PC WorldBench 98 score/rating	Price	Ease of use and design/setup	Graphics	Reliability/service	Features
77	169/very good	moderate	very good/outstanding	good	outstanding/fair	8.4GB hard disk, 17X-40X CD-ROM drive, 56-kbps modem, 17-inch monitor, integrated ATI Rage Pro Turbo (8MB SGRAM), 3-year parts/1-year labor warranty, 24/7 tech support.
75	167/very good	moderate	good/outstanding	very good	good/good	5.1GB hard disk, 4X DVD-ROM drive, 56-kbps V.90 modem, 15-inch monitor, integrated ATI Rage Pro Turbo (8MB SGRAM), 1-year parts and labor warranty, 24/7 tech support.
72	119/fair	inexpensive	fair/outstanding	fair	good/fair	4GB hard disk, 14X-32X CD-ROM drive, 56-kbps V.90 modem, 15-inch monitor, integrated ATI Rage Pro Turbo (2MB SGRAM), 1-year parts and labor warranty, 24/7 tech support.
72	171/very good	inexpensive	good/outstanding	good	good/unacceptable	4.3GB hard disk, 16X-32X CD-ROM drive, 56-kbps V.90 modem, 15-inch monitor, integrated ATI Rage Pro Turbo (2MB SGRAM), 1-year parts and labor warranty, 20/7 tech support.
70	169/very good	moderate	good/very good	fair	good/fair	9.5GB hard disk, 12X-32X CD-ROM drive, 56-kbps V.90 modem, 15-inch monitor, integrated ATI 3D Rage LT Pro (4MB SGRAM), 1-year parts and labor warranty, 24/7 tech support.
Scorecard weightings ▶	Performance 10 percent	Price 25 percent	Design/setup 25 percent	Graphics 5 percent	R&S 25 percent	Features 10 percent

of Micron owners responded that they would willingly buy Micron home PCs again the next time they needed a new PC.

5 IBM Aptiva E5D

If you don't mind paying a little extra for a PC you can count on, the Aptiva E5D may be a good choice. In our latest survey, only Dell's PCs scored higher for reliability. And that's the strongest reason to buy IBM's Aptiva E5D for your home office.

For the money ($2048), the Aptiva E5D and its PII-400 CPU come up a bit short in the performance department. Its overall PC WorldBench 98 number (185) is well below the average score for its configuration—and closer to that of the substantially cheaper, PII-350–equipped Millennia 350 and NEC Ready Office systems.

Setup was easy thanks to excellent documentation and clearly marked cables. The E5D performed well on our Director and AVI test, indicating its strength in handling nongaming multimedia titles such as Microsoft's PowerPoint. But like the NEC and the Micron, the Aptiva posted less-than-stellar graphics scores in our fast-moving 3D game tests.

Intensive home office users may want to invest an extra $200 to move up from the standard-issue 15-inch monitor to a 17-inch model. IBM's rapid-access keyboard includes convenient buttons for launching applications and controlling CD play and volume, though the system's Infinity speakers produce unremarkable sound. The system will ship with a 4X DVD-ROM drive, but we tested a preproduction model equipped with a CD-ROM drive.

The Aptiva E5D ships with IBM's Via Voice Gold voice recognition program and a headset microphone designed for it. This outdated version lacks the enhancements of the new ViaVoice 98, and it's unlikely to save you time in the long run.

Other software included with the Aptiva definitely *will* save you time and money: a full copy of IBM's Lotus SmartSuite, Norton AntiVirus, and the Worldbook 98 multimedia encyclopedia.

Family

1 Dell Dimension V333c

Our definition of the ideal family PC is a system that's reliable, easy to use, and simple to set up. The $1529 Dell Dimension V333c hits all three marks, making it our top family system. Performance isn't bad either. Powered by Intel's Pentium Celeron-333 CPU, this system scored 169 on the PC WorldBench 98 test, certainly respectable for a family PC and tied for second among the family PC chart makers.

Setup was a snap. The box opens to a clear diagram illustrating what (including the speakers) plugs in where. All integrated ports on the back of the case are color- and symbol-coded, as are the connectors that fit into them. We were up and running in less than 20 minutes.

Dell's sound and images lacked the wow effect of some of the more expensive systems we tested. But the integrated Yamaha sound board and Harmon/Kardon speakers are adequate for listening to music, especially compared to the Victrola-in-a-linen-closet sound we usually encounter on low-cost family systems.

The Dell UltraScan 1000HS 17-inch Trinitron monitor (ranked seventh in this month's Top 10 Monitors chart) displayed beautiful graphics—sharp photographic images, vivid colors, and 3D that looked almost lifelike. This sharpness and clarity are also evident when viewing text. Performance on 3D games was a bit slow; but of the five chart-making family systems, the Dimension V333c (along with the Sony VAIO) performed best on this measure.

The tall, narrow V333c is highly expandable, with three open expansion slots and four empty drive bays.

The V333c's software bundle is limited to Microsoft's Home Essentials and Encarta 98. In our recent reliability and service survey, subscribers gave Dell's PCs the highest reliability rating among all home vendors.

2 Sony VAIO PCV-E204

The short, wide-body $1549 Sony VAIO PCV-E204 doesn't skimp on features compared to taller midtower PCs—it just puts everything into a smaller package. The purple and pewter-gray microcube VAIO is the only family PC we reviewed with a premium Intel CPU—a 333-MHz Pentium-II—and a DVD-ROM drive.

The VAIO fared well in our multimedia and 2D and 3D graphics tests. Video ▶

IN ASSESSING FAMILY SYSTEMS, WE FOCUSED ON PRICE, SETUP, EASE OF USE, AND GOOD DESIGN.

FUN and GAMES

IF YOU'VE RECENTLY purchased a home PC, chances are it came with at least a few applications and maybe even a full-fledged business suite already installed. But don't forget that your PC can play a major role in home entertainment, too.

You can get some of it for free. Here are three sites we like. Kidz Connection (www.crl.com/~colocomp/kidz.htm) contains children's programs ranging from preschool number games to multimedia spelling bees to memory-building exercises. The nonprofit Educational Software Cooperative (www.edu-soft.org) distributes software geared toward children of all ages. We found spelling and dinosaur-theme number games, as well as applets for home inventory. Finally, Soft-Seek (www.softseek.com) sports such unique offerings as an arcade-style game that uses UFOs piloted by cows to interpret crop formations.

In search of something faster paced? How about a new generation of force-feedback joysticks that let you feel the action.

We tried Microsoft's $150 SideWinder Force Feedback Pro, top (www.microsoft.com/sidewinder; 800/426-9400), and Logitech's new $130 WingMan Force (www.logitech.com; 800/231-7177). The SideWinder ships with MDK, Interstate '76, and Shadows of the Empire, while the larger WingMan Force includes Redline Racer, Descent Freespace, and WarBirds. Both sticks are designed for right-handed users only.

When the plane or chopper crashes, the SideWinder vibrates rapidly back and forth, while the WingMan Force delivers more complex 3D sensations. Layers of pulsating explosion seemed more realistic in testing of games like Microsoft's Motor-Cross Madness and Jane's Israeli Air Force. Not all games support force feedback, and not all of those that do are compatible with all joysticks, so shop carefully.

clips played back smoothly without visible dropped frames. We encountered some visual distortion, including pixelation, playing strenuous 3D games such as Redline Racer, but it wasn't any worse than in other family systems. The desktop speakers and subwoofer built into the 15-inch Trinitron monitor provide slightly better-than-average sound quality.

Six handy programmable buttons at the top of the keyboard allow you to launch applications or connect to the Internet. Getting online is as easy as running the Easy Internet Access guided audio tour.

The E204's tight interior design won't win any commendations. To gain access to the sole free internal drive bay, you have to pry off the front bay cover, remove the DVD-ROM face plate, release the inner front panel, and remove the side and bottom panels. The software bundle includes a little something for everyone: Encarta 98 for the kids, Microsoft Works and Money for their parents, and Adobe Photo Deluxe for the whole family.

Sony's home systems got a good rating for both reliability and service in our most recent survey of *PC World* subscribers, landing Sony among the top three manufacturers in both categories.

3 IBM Aptiva E2N

The $1048 IBM Aptiva E2N is the least-expensive chart maker in this roundup—nearly $500 cheaper than the top-rated Dell Dimension V333c. Throw in IBM's record for reliability among home systems and a great setup experience, and you have our number three family PC.

Setup was nearly hassle-free, thanks to amply illustrated assembly steps; color-coded cables, ports, and speakers; and detailed and clear documentation. The Aptiva Installer's step-by-step instructions made it the most helpful among the family PC tutorials we tested.

The small, gray midtower is space efficient, but its interior feels cramped. You get room for only one more drive, memory module, and expansion card. The E2N comes with the useful Lotus SmartSuite.

The 15-inch IBM 2124 monitor earned mixed reviews. We found the display's focus slightly blurry on text-based screens, particularly in the corners. Graphics fared better, but we still detected some blurriness. Though the monitor has several adjustment control buttons, you can't square off the image properly because certain controls (such as tilt) are missing.

The Aptiva E2N scored near the bottom in our 3D gaming tests, thanks to its scant 2MB of video RAM and slowpoke CPU. The system's PC WorldBench 98 score of 119 is acceptable for a family system but the lowest in the entire review. This is due in part to the cost-conscious AMD K6-266 chip. Sound was passable for everyday use but had a discernibly tinny edge that made listening to music annoying. Finally, in the reliability component of our survey of *PC World* subscribers, IBM's home systems ranked second only to Dell's.

4 Packard Bell Multimedia 945

At $1178, the Packard Bell Multimedia 945 carries the next-to-lowest sticker price on the family chart, second only to IBM's Aptiva E2N. Its performance score was the highest among family systems, beating even the Dell Dimension (both run on Intel's Celeron-333 processor). A poor service record and underwhelming multimedia performance prevented this PC from scoring better.

System setup was quick, thanks to color-coded and labeled ports and cables. A helpful on-screen menu of step-by-step instructions covers everyday tasks like listening to an audio CD, searching for help, and working with Windows.

The closest we can come to singing the praises of the 945's 15-inch multimedia monitor is to hum its adequacies. Text quality was okay, but colors seemed bland in our image tests—fresh fruit in a photo looked canned, for example.

A small, low-quality microphone—for use with a voice-mail application or for teleconferencing—is embedded in the top of the monitor's case, and semicircular speakers are built into the sides, making the monitor resemble a robot's head. Audio quality is so poor that you won't want to listen to music on this system. The bass sounds quite fuzzy (as if you ▶

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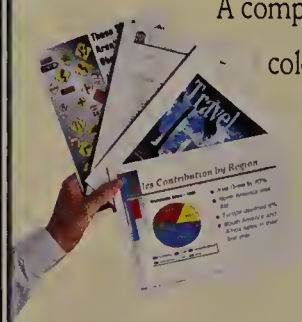

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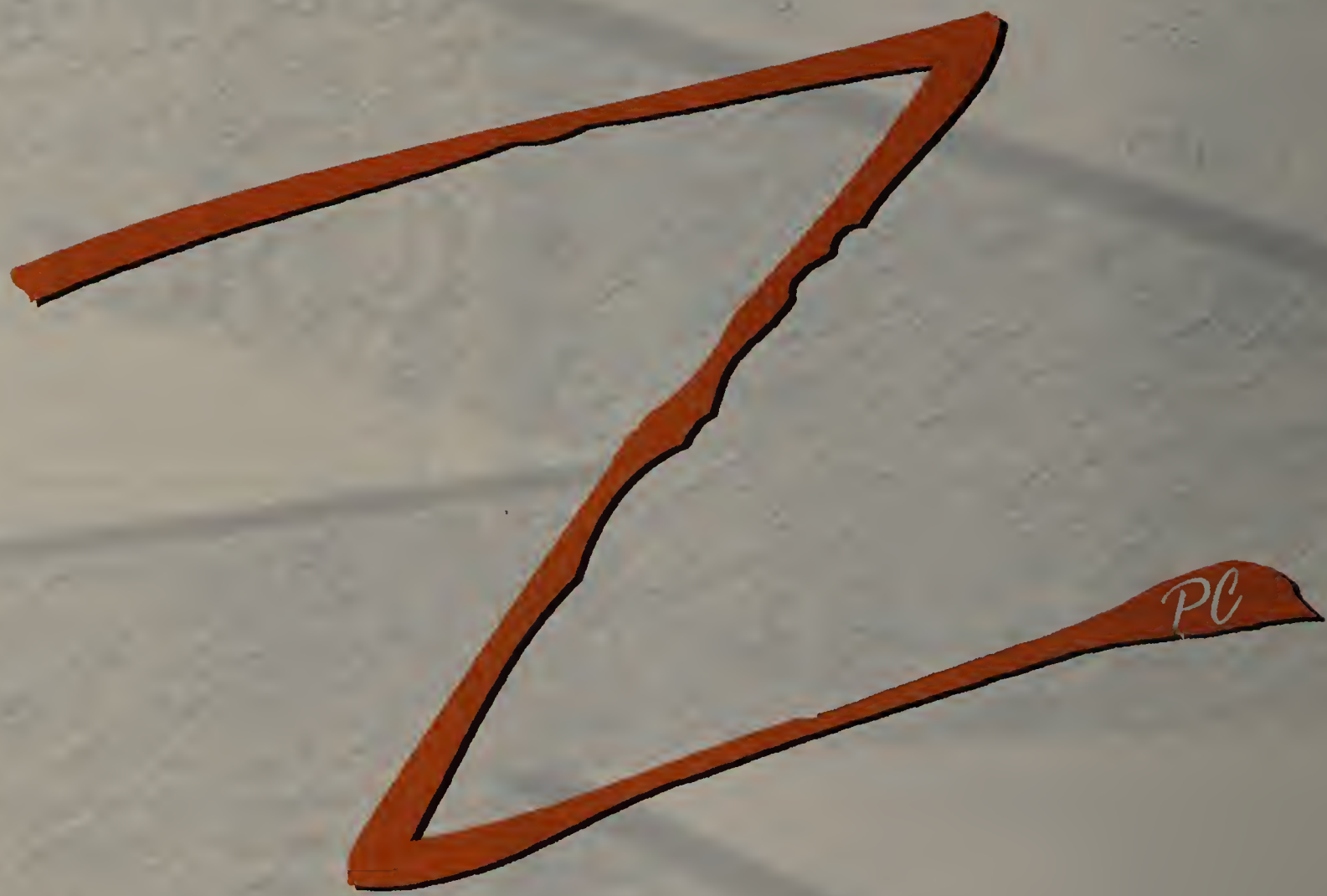

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were listening to it underwater), and the treble has a distinctly shrill edge. Oddly, neither control is adjustable.

The Multimedia 945's interior is uncluttered, with cables bundled and all upgrade areas easy to access. Both RAM slots are full, but you'll find two open PCI slots and two open drive bays (one internal, one external). Microsoft Word 97, Works, and Encarta 98 and Quicken 98 Basic make up the software bundle.

PC World subscribers in our recent survey were disappointed with Packard Bell's service for home systems. The company's "Buy Again" rating based on service was among the worst for any PC maker, as was its rating for problem resolution.

5 Compaq Presario 5150

Rounding out our family chart, is the feature-rich $1548 Compaq Presario 5150, which sports 128MB of RAM, a network card, and a 9.5GB hard disk.

The curved minitower case flares out at the bottom and features a plastic flip-up front panel housing USB and MIDI ports. On most PCs these are situated (inconveniently) in the back, so their placement here is a pleasant surprise. The integrated network card allows you to set up a home network or to configure a cable modem.

The keyboard features convenient audio and CD-ROM controls. The Presario 5150's sound quality trails that of the Dell Dimension V333c, but unlike the Packard Bell, this system provides good enough sound for music listening. The software bundle includes Microsoft's Works, Bookshelf 98, Encarta 98, and Money 98, plus Incoming—Rage's aerial fighting game.

The interior design of our test system is among the worst we've seen. The cramped interior awkwardly drops a large power supply smack dab in the middle of the chassis and erects a slab of reinforced steel at the top, restricting access to the drive bays and motherboard. The system offers just one open drive bay.

FOR GAMING SYSTEMS, WE GAVE SPECIAL WEIGHT TO PERFORMANCE, GRAPHICS QUALITY, AND FEATURES.

In our test image of a fruit tart, the 15-inch monitor richly displayed the colors of peaches and strawberries. Text was less appetizing: desktop icons lacked sharpness, and text in the corner of the screen looked fuzzy. The 5150's PC WorldBench 98 score of 169 is average for its chip configuration (and on par with a Celeron-333).

Compaq's service and reliability both ranked in the middle of the pack for home systems in our survey of *PC World* subscribers. Respondents gave Compaq tech support representatives the lowest rating for level of knowledge about their PCs.

Gaming PCs

1 Micron Millennia 450 Max

Speed. It's the never-fully-satisfied demand of every fanatical game player. So it's appropriate that our number-one gaming system, the Millennia 450 Max from Micron, is also the fastest home PC we've ever tested, boasting a whopping PC WorldBench 98 score of 221. It's the perfect system for the serious game player—And since it costs $2899, you'd better be *really* serious.

The Diamond Viper V550 graphics card, with its state-of-the-art NVidia RIVA TNT chip set and 16MB of SDRAM, pumped out smooth images in our 3D gaming tests. In fact, the Micron posted the highest overall score on all three games we tested. Clouds and explosions in Incoming were smooth and realistic, and the textures of the dinosaurs in Turok were ostrich-skin authentic. In our 2D graphics testing, video playback was a tad choppy, and Director ran slower than with the other gaming PCs.

Micron's 19-inch, 900LX monitor delivered rich colors and sharp images and text. Welcome hardware pluses include a 2X DVD-ROM drive (and a video-out port for connecting it to a television), a first-rate Microsoft Sidewinder Pro joystick, and a PC Pro Pad 4 game pad. The Advent AV390PL speakers offered full, rich sound for music and game play alike.

True to its gaming heart, the 450 Max comes equipped with Microsoft's Flight Simulator 98, Incoming, X-Wing versus TIE Fighter, and Need for Speed.

The easy-open case of this beige midtower contains more than just fun and games. The 14.4GB hard drive and built-in Zip drive offer a wealth of storage, ideal for digital camera or digital video users. Three open slots and three open drive bays will satisfy your need for expansion.

Micron's home systems fared well in our latest reliability and service survey of *PC World* subscribers. Our respondents gave the company an excellent buy-again rating based on reliability.

2 Gateway G6-450

Our second-ranked gaming system, the Gateway G6-450, rumbles in at $2721, $178 cheaper than the top-ranked Micron, and it's by no means a stripped-down PC.

Performance is this system's strong suit, as it posted a lofty 214 on our PC

GAMING PCs

	SYSTEM	CPU	Street price (9/15/98)	Comments	InfoNet number
1	Micron Millennia 450 Max 888/634-8799 www.micronpc.com	Pentium II-450	$2899	PRO: Very fast, Microsoft SideWinder joystick, game pad, lots of gaming software. CON: Very expensive.	708
2	Gateway G6-450 800/846-2000 www.gateway.com	Pentium II-450	$2721	PRO: Fast, great speakers, CD-Rewritable drive. CON: Expensive.	709
3	Compaq Presario 5600-450 800/345-1518 www.compaq.com	Pentium II-450	$2699	PRO: Built-in ethernet, fast performance. CON: No gaming titles.	710

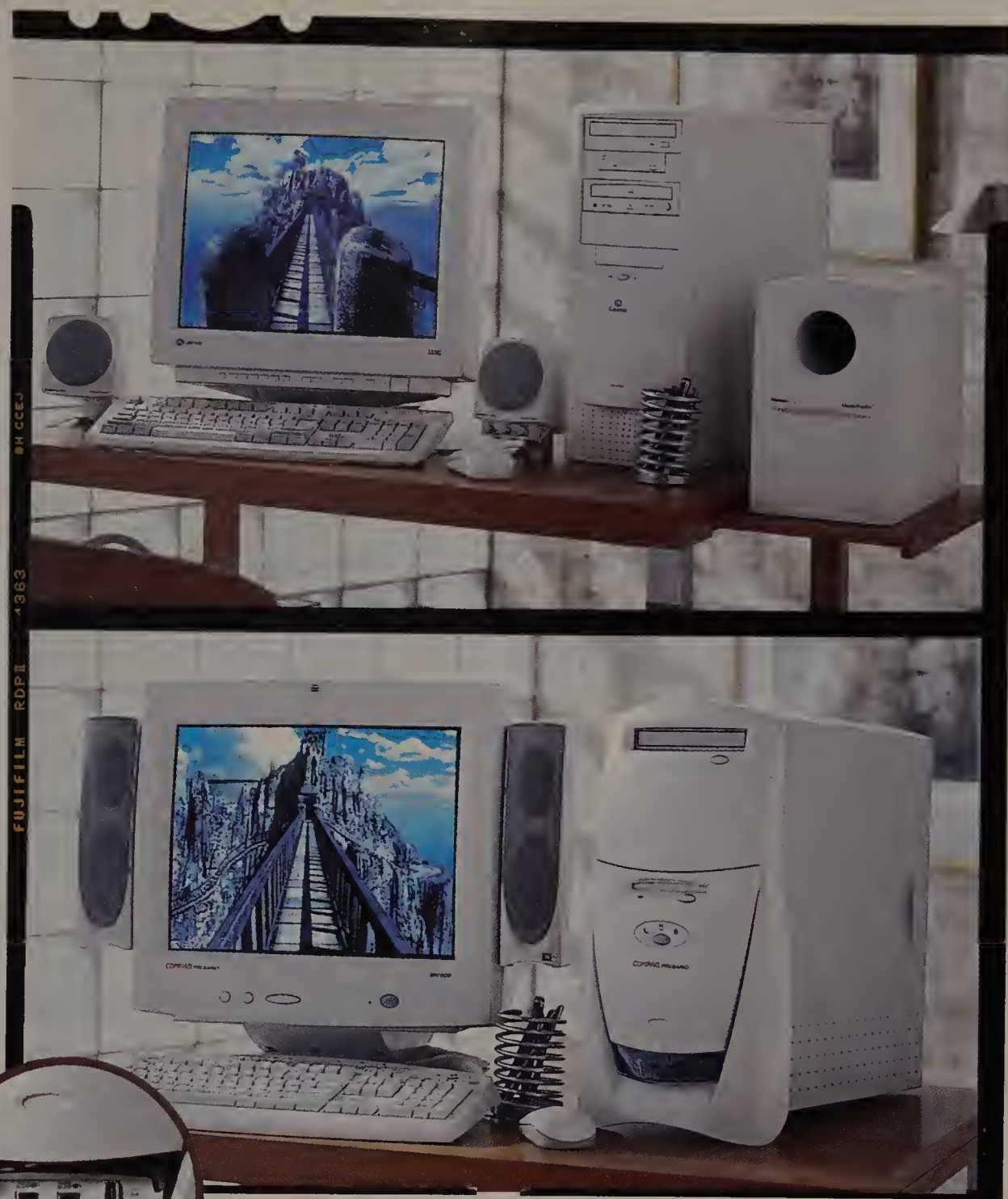
Best Buy [1] 5-year warranty on RAM and CPU, 3 years on other components, 1-year labor warranty. All products: 910

WorldBench 98 test suite. Our test system was configured with the STB Velocity 128 ZX graphics card coupled with a 3DFX Voodoo2 add-on card with 12MB of EDO RAM. Gateway now ships the G6-450 with either an ATI Rage Pro Turbo card or the NVidia RIVA TNT. The G6-450 supported smooth images and transitions in all three gaming tests and a great frame rate in our 2D Director test.

The big, sharp VX900 Gateway 19-inch monitor in combination with the rich-sounding Boston Acoustics MediaTheater Sound System creates an impressive sound-and-display show. Great speakers with a subwoofer and a rear speaker produce realistic 3D sound.

The built-in Philips 3610 rewritable CD-ROM drive, situated beneath the DVD-ROM and floppy drives, will appeal to anyone who needs to store large multimedia files. It writes at 2X and comes with two 650MB CD-Recordable discs and one 650MB CD-Rewritable disc. Adaptec's handy Direct CD program lets you pull data from within applications such as Word and write the information to a CD.

The G6-450 comes with the games Quake II, Hexen II, Heavy Gear, and Battlezone. But Gateway will charge you extra to add a joystick. The system is easy to set up, and Gateway provides typically strong documentation. The company's service was rated among the best for home systems, but its reliability rating is far from stellar. Gateway received poor scores for its problem systems, and its dead-on-arrival ranking was the worst of any PC maker in our survey.



GAMING GALORE: The Gateway G6-450 (top) delivers top-notch gaming and graphics as well as impressive 3D sound. The Compaq Presario 5600 brings one of two FireWire ports and USB ports up front for greatest convenience.

3 Compaq Presario 5600-450

Compaq kept an eye on the future in building the Presario 5600. With a 450-MHz Pentium-II CPU and 128MB of RAM, this midtower can handle any game currently on the market, and it makes a great hedge against future obsolescence. At $2699, it's also the least expensive of our top three gaming systems.

If you want to connect to the Internet via ADSL, the 5600 should be available with a dual analog-digital modem that supports both a standard 56-kbps and ▶

SCORECARD

★ Overall rating	PC WorldBench 98 score/rating	Price	Ease of use and design/setup	Graphics	Reliability/service	Features
83	221/outstanding	very expensive	good/very good	outstanding	good/good	14.4GB hard disk, 2X DVD-ROM drive, 56-kbps modem, 19-inch monitor, Zip drive, Diamond Viper V550 (16MB SDRAM), warranty varies, 1 24/7 tech support.
80	214/very good	expensive	outstanding/outstanding	very good	fair/good	10GB hard disk, 2X DVD-ROM drive, 56-kbps modem, 19-inch monitor, STB Velocity 128 ZX (8MB RAM) and 3DFX Voodoo2 (12MB EDO RAM), 3-year parts and labor warranty, 24/7 tech support.
79	216/very good	expensive	very good/outstanding	good	good/fair	12.9GB hard disk, 2X DVD-ROM drive, 56-kbps V.90 modem, 19-inch monitor, integrated ATI Rage LT Pro (8MB SGRAM) and Diamond Monster 3DII (8MB), 1-year parts and labor warranty, 24/7 tech support.
Scorecard weightings ▶	Performance 20 percent	Price 10 percent	Design/setup 15 percent	Graphics 15 percent	R&S 25 percent	Features 15 percent

Time Trials: Who's Got Speed to Burn?

Dell's Dimension XPS R450—strong at work or play. Micron's Millennia 450—the right bet for gamers.

		GRAPHICS BOARD	CPU	Application tests: PC WorldBench 98 score	Application tests: Application test times (Faster)	Graphics tests: 3D graphics rating	Graphics tests: Playback tests (frames per second) (Faster)
Home Office	1	Dell Dimension XPS R450*	Pentium II-450	218		excellent	94, 74, 46
Home Office	2	Gateway GP6-450	Pentium II-450	213		moderate	95, 39, 23
Home Office	3	NEC Ready Office 2010	Pentium II-350	183		poor	90, 16 — System failed to perform the Redline Racer test.
Home Office	4	Micron Millennia 350	Pentium II-350	178		moderate	93, 30, 21
Home Office	5	IBM Aptiva E5D	Pentium II-400	185		moderate	90, 39, 44
Family	1	Dell Dimension V333c*	Celeron-333	169		excellent	85, 31, 19
Family	2	Sony Vaio PCV-E204	Pentium II-333	167		moderate	92, 31, 20
Family	3	IBM Aptiva E2N	AMD K6-266	119		moderate	50, 19, 14
Family	4	Packard Bell Multimedia 945	Celeron-333	171		moderate	84, 26, 25
Family	5	Compaq Presario 5150	AMD K6-2-350	169		moderate	78, 29, 19
Gaming	1	Micron Millennia 450 Max*	Pentium II-450	221		excellent	93, 72, 63, 76
Gaming	2	Gateway G6-450	Pentium II-450	214		excellent	95, 60, 58, 68
Gaming	3	Compaq Presario 5600-450	Pentium II-450	216		excellent	95, 59, 57, 64

*Best Buy n/a = not applicable Minutes 0 10 20 30

Word 97 · Word Pro 97 · Excel 97 · 1-2-3 97 · Paradox 8.0 · Picture Publisher 7.0 · Director and AVI · Redline Racer · Incoming · Turok Dinosaur Hunter

TEST PC WORLD CENTER **HOW WE TEST** All systems are tested with PC WorldBench 98, *PC World*'s application-based benchmark. A higher PC WorldBench score is better. All PCs are tested with Windows 98, and video resolution is set to 800 by 600 in 65,536 colors. We run automated scripts on six popular business applications, performing common tasks such as spelling checks, scrolls, saves, sorts, and recalculations. The PC WorldBench 98 score is a sum of the weighted, normalized result of each script: Word 97 (10 percent), Word Pro 97 (10 percent), Excel 97 (20 percent), 1-2-3 97 (20 percent), Paradox 8.0 (20 percent), and Picture Publisher 7.0 (20 percent). Our graphics test results reflect both objective frame rates and subjective results from 3D games. For 2D and multimedia testing, we play a looping AVI video in the background at twice its native size. We then play a Macromedia Director 6.0 animation in the foreground with the video continuing to loop in the background, and calculate the frame rate of the foreground animation. Video drivers are set to 800 by 600 by 16,000 colors at 75 Hz. For 3D games testing, we run Redline Racer and Incoming scripts (we added Turok Dinosaur Hunter for gaming PCs) and then calculate frame rates and subjectively grade visual and overall performance. For more details on our benchmark and how we run it, see PC World Online (www.pcworld.com/testing). Data based on tests designed and conducted by the PC World Test Center. All rights reserved.

an ADSL connection. Though this feature hadn't been introduced at press time, it's a nice extra that can save you hundreds of dollars on a dedicated ADSL modem. Moreover, the included ethernet card is a first step toward creating a home network.

The Presario 5600 has more going for it than just convenient networking. In our 2D Director test with AVI in the background, the 5600 produced smooth video playback and posted the highest frame rate of any PC in this review. In our 3D game testing, the 5600 was a hair slower than the other two gaming system chart makers and the Dell Dimension XPS R450, but game play was still excellent.

The sole gaming title bundled with the PC is Incoming. You also get Africa: The Serengeti DVD-ROM. The Compaq 2X DVD-ROM and Compaq MV900 19-inch monitor performed well in our extensive multimedia tests, producing clear images and smooth playback on par with the other chart-making gaming systems.

At the bottom of the Presario 5600's case hangs a small plastic door that flips up to reveal other obsolescence busters—two conveniently placed USB ports and a single IEEE 1394 port for handling connections to high-bandwidth devices such as digital video and still cameras.

Good documentation and color-coded ports and cables make setup easy, and the system's multimedia keyboard lets you control the sound and the DVD-ROM drive, as well as launch applications. Compaq's home systems received average scores in our reliability and service survey of *PC World* readers.

online *For reviews of systems that didn't make the charts, visit PC World Online at www.pcworld.com/dec98/homepcs. Kirk Steers is a contributing editor for* PC World. *Susan Silvius is a freelance writer based in Northern California. Cameron Heffernan is an associate editor and Mick Lockey an assistant editor for* PC World. *Testing was performed by Ulrike Diehlmann, Jeff Kuta, Alex Jorge, and Sean Tieu of the PC World Test Center.* ■

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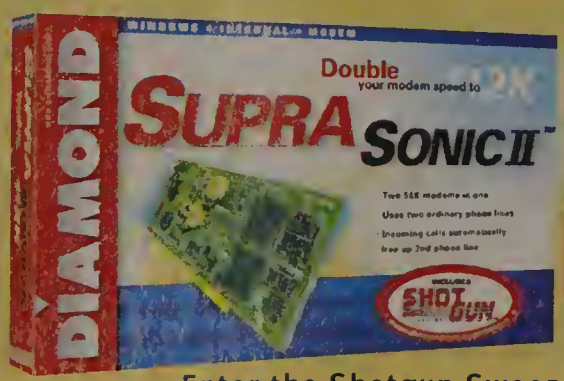

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Creating slick marketing presentations? Or printing your own photographs? There's a color printer out there that fits your needs.

BY DAN LITTMAN

Color captivates. Whether you're looking at a personal letter, a business brochure, or a graphic presentation, color text and images catch the eye and make complex information clearer and livelier. And since color increases the impact of any printed document, it can even help your business attract customers. But when it comes to buying a color printer, the sheer volume of products on the market can make choosing one hard. How do you decide which kind of printer—a low-end ink jet, ▶

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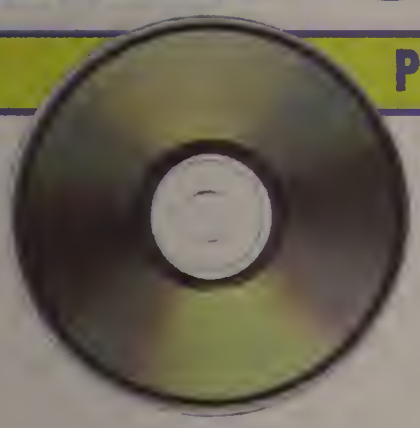

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Color for All Kinds

TOP: High speeds and lovely print make HP's $299 DeskJet 722C a small-business Best Buy. MIDDLE: The $249 Canon BJC-5000, our home Best Buy, balances price, features, and print quality. BOTTOM: Our corporate Best Buy, the $2999 Lexmark Optra SC 1275, is a fast, versatile color laser.

PHOTOGRAPHS BY DANIEL FURON

a midrange ink jet, or a color laser—is best for you? Ignore the flashy promises and consider what you want to see on the page.

Do you need to give clients hard copies of your design ideas? Does your department demand laser speed with color capacity? Or do you just want to include colorful doodles in a letter? Whatever your needs may be, one of the 16 color printers we tested this month is sure to fill the bill. We analyzed everything from bargain-price ink jets to sophisticated color lasers. To help simplify your decision, our recommendations include 3 printers for smaller businesses, 4 for home users, and 3 for larger businesses.

Since we ran a new suite of tests on every printer, and because the new divisions compare printers that were not previously compared (such as high-end and low-end ink jets), you'll see some changes in the order of the *Top 10 Printers* chart (page 233) from previous months. This month's revamped all-color chart includes a combined small-business and home section, in addition to rating workgroup-oriented devices; future issues will alternate between all-color and all-monochrome printers. Want to see reviews of even more printers? Check out PC World Online at www.pcworld.com/dec98/printers for the lowdown on six models that missed this month's Top 10. While some of these are just plain inferior, others are good printers that are geared toward niche markets. The $799 Hewlett-Packard 2000Cse, for example, is a terrific ink jet for small networks that need speed but can't afford laser prices (and that don't need a laser's paper capacity).

> The sheer number of color printers currently on the market makes choosing one difficult.

THREE TIERS FOR COLOR

IF YOU HAVE a small business or a home office, a color laser is probably beyond your budget. No problem. Plenty of ink jets can produce top-quality presentations and brochures and, in some cases, lifelike photos. Support for extra paper trays might also come in handy, and if you plan to share the printer, a network interface may be available. HP's $299 DeskJet 722C, our Best Buy for small-business users, offers high print speeds, strong print quality, and very good paper-handling options. But it supports neither networks nor expansion paper trays. For such features, look to more expensive models like HP's DeskJet 895Cse or 2000Cse.

If you're buying a home printer, you probably don't need the fastest model money can buy. Paper trays and other options might be unnecessary, too. But you don't want to sacrifice print quality, and you'd like to print photos, greeting cards, and banners—for which bundled software is a plus. All these needs spell low-cost ink jet. Our Best Buy for home users, the $249 Canon BJC-5000, has good text print quality, wide-format printing ▶

SCORECARD

Cheap Ink Jets Are Strong on Features

		PRINTER	Street price (9/1/98)	Printer type	Tested print speed for text/ graphics (ppm)	Print quality of text/ graphics	Features	Installation	Documen-tation	Design	Paper handling	Software interface	Support quality
Small-business/home	1	[1] HP DeskJet 722C	$299	ink jet	4.1/0.3	good/ good	very good	excellent	excellent	adequate	very good	adequate	adequate
	2	Epson Stylus Photo 700	$279	ink jet	1.3/0.4	adequate/ good	very good	very good	excellent	good	very good	excellent	good
	3	[2] Canon BJC-5000	$249	ink jet	2.3/0.4	good/ adequate	very good	excellent	poor	very good	excellent	good	good
	4	Lexmark 5700 Color Jetprinter	$249	ink jet	2.9/0.3	good/ good	adequate	excellent	very good	adequate	very good	very good	adequate
	5	Lexmark 3200 Color Jetprinter	$179	ink jet	2.1/0.4	good/ good	adequate	good	very good	adequate	very good	very good	adequate
	6	Epson Stylus Color 1520	$799	ink jet	3.3/1.2	good/ good	very good	excellent	excellent	adequate	excellent	very good	good
	7	Canon BJC-4400	$179	ink jet	2.1/0.4	adequate/ adequate	good	excellent	very good	good	excellent	adequate	good
Corporate	1	[3] Lexmark Optra SC 1275	$2999	laser	7.5/0.5	good/ good	very good	very good	excellent	excellent	very good	excellent	adequate
	2	Minolta Color PageWorks PS	$3299	laser	6.0/0.4	good/ good	very good	poor	good	excellent	very good	good	good
	3	QMS Magicolor 2 CX	$3200	laser	9.7/0.5	good/ excellent	excellent	very good	poor	good	adequate	excellent	adequate

[1] Small-Business Best Buy [2] Home Best Buy [3] Corporate Best Buy Recommended for home.

Also see Top 10 chart, page 233.

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and other handy features, and a simple software interface.

If you're buying a large-office printer, you may wonder why color lasers often cost over ten times as much as ink jets. Conventional wisdom has it that color lasers have better print quality than ink jets, but our tests suggest that print quality varies as much among lasers as among ink jets. Lasers offer other benefits to justify their price tags: enough speed for busy workgroups, broader paper-handling options, more memory for complex jobs, and network support. Our corporate Best Buy, the Lexmark Optra SC 1275, costs under $3000, prints quickly, and is easy to use.

Every printer has its useful features and its ill-advised ones. In "Loved It, Hated It" (pages 172, 176), we highlight the best and worst components—from easy-to-insert toner cartridges to flimsy paper trays—among this batch of printers.

Finally, no matter which kind of printer you buy, you'll probably need technical support at some point. To find out which companies' representatives are the most responsive, courteous, accurate, and thorough, we conducted an informal survey of their phone help. Check out our surprising findings in "Help Me, Please: Printer Makers Offer Spotty Tech Support" (page 176).

Small-Business/Home PRINTERS

Whether you've got a small business or a home office, you need print quality that reflects your company: clear, sharp, and professional. Speed is also a plus, and two of the printers below, the HP DeskJet 722C and the Epson Stylus Color 1520, print text more than 60 percent faster than the average home ink jet.

The following seven models offer extensive media-handling options that can simplify production of marketing brochures, sales reports, and graphic presentations. They can also make personal documents like letters and greeting cards more fun.

1 HP DeskJet 722C

STREET PRICE: $299

SUMMARY: Straddles the small-business and home markets with good overall print quality and the fastest text printing of any ink jet here.

If you need business-level quality and quick output but can't afford a color laser, the DeskJet 722C is the perfect compromise. Printing text at 4.1 pages per minute, it's the fastest ink jet we tested. The 722C's output also looks better than similarly priced ink jets'; the sharp text looks almost as good on plain paper as on ink jet paper—something few ink jets can boast. Color graphics are smooth, with realistic hues and subtle details; gray-scale graphics are equally attractive. The stylish printer is also quiet, a welcome attribute if you're often on the phone.

A bundled CD-ROM includes Corel Print & Photo House Select, Streetwise Software's By Design, and a 32-page crash course in graphic design. There's no optional paper tray, so you can't augment the 100-sheet input capacity (which is the same as most ink jets'). • **Hewlett-Packard; 800/752-0900; www.hp.com**

INFONET NO. 614

2 Epson Stylus Photo 700

STREET PRICE: $279

SUMMARY: A standout choice for companies that don't need blazing speed but want outstanding print quality on photographs.

If your office depends on photographs—as many real estate agencies and interior design firms do, for example—Epson's Stylus Photo 700 can provide an instant link to the outside world. If you purchase Epson's $599 PhotoPC 700 digital camera, you can connect it directly to the printer and print 4-by-6-inch photos.

Even without a digital camera, the $279 Stylus Photo 700 offers great photo features. Its six-color ink technology produces subtle, realistic color graphics and photos—the best of this group on high-quality ink jet paper. Color printing on ordinary paper is about the same as with the other printers here—less impressive but still good. It also prints crisp black text on good paper, though on plain paper the HP DeskJet 722C does better. Gray-scale graphics are gorgeous, even on regular paper.

The Stylus Photo 700's Achilles' heel is performance: At only 1.3 ppm on text, it's snail-like compared to the other ink jets on the chart. But the 700 can help small businesses in other ways. Its ease of use will minimize the need for training multiple users. A strong photo-oriented software package is bundled with the printer, including Adobe PhotoDeluxe, a photo-archiving database, and a program for creating panoramic images. And Epson sells a vast assortment of media—more than HP—specifically for the 700, including 4-by-6-inch snapshot sheets ($6.99 for a package of 20) and 8.5-by-24-inch panorama sheets ($16.57 for 10). • **Epson America; 800/463-7766; www.epson.com**

3 Canon BJC-5000

STREET PRICE: $249

SUMMARY: This ink jet, one of the fancier home models, produces strong text prints and competent color images on a range of paper types, including wide-format pages (up to 11 by 17 inches).

For sheer variety of paper options at a wallet-friendly price, the Canon BJC-5000 tops our list for home users. For $249 you get features galore, including the ability to print on tabloid-size (11-by-17-inch) paper. This wide format is handy for posters and other odd jobs, but hand-feeding pages one at a time through a slot at the back of the printer is a pain.

We like the 5000's even text, which looks similar to that of ▶

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The ScanMaker X6EL's new push-button design calls up Microtek's new *ScanSuite™* utility. ScanSuite's presets let you quickly scan photos or documents and route them to your printer for a quick copy, your fax or email software, or directly to *Adobe Photoshop LE* (included), *Caere OmniPage Limited Edition* OCR (included), or any favorite application you have on your computer. To access even more image controls and effects, ScanSuite also lets you call up Microtek's award-winning *ScanWizard™* Twain-compliant scanning software.

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SMALL-BUSINESS/ HOME PRINTERS (clockwise from top left): Lexmark 5700 Color Jetprinter, Canon BJC-4400, Lexmark 3200 Color Jetprinter, Epson Stylus Color 1520, Epson Stylus Photo 700.

the small-business printers we tested. Colors are detailed, if a bit flat, and it produces gorgeous graphics on high-quality paper.

Unique to the Canon BJC-5000 is the ability to run dual black cartridges for nonstop text printing, or dual color cartridges for heavy-duty color jobs. Performance is about average for a home printer. We have just two minor complaints: The BJC-5000 makes a real racket while it's printing, and the manual's troubleshooting section is ridiculously brief. • **Canon Computer Systems;** 800/652-2666; www.ccsi.canon.com

INFONET NO. 615

4 Lexmark 5700 Color Jetprinter

STREET PRICE: $249

SUMMARY: Slightly faster than the Canon BJC-5000 but with less impressive features. Home users will appreciate its software bundle.

At $249, the home-oriented Lexmark 5700 Color Jetprinter competes head-to-head with the Canon BJC-5000. Its performance is not significantly faster; the main difference is that the 5700 does not print 11-by-17-inch documents. The 5700 prints clean text, with a grayish look and only a hint of jaggedness on curves, and color graphics that are detailed, if less vivid.

The 5700 Color Jetprinter's design is a mixed bag: We were impressed by the printer's sturdiness, including strong paper supports, and by its separate manual-feed slot, which enables you to print an envelope without emptying the main paper tray. Unfortunately, the printer's power supply is an enormous brick that would cover sockets on a power strip. The 5700's features are somewhat less impressive than the Canon's.

On the upside, the 5700's CD-ROM software bundle is good for families. It includes 3M's Post-it designer, photo-editing applications from LivePix and ArcSoft, and Monotype's greeting-card and T-shirt design programs. On the downside, this model doesn't print banners, unlike most home-oriented ink jets. • **Lexmark International;** 800/539-6275; www.lexmark.com

INFONET NO. 616

5 Lexmark 3200 Color Jetprinter

STREET PRICE: $179

SUMMARY: Bargain hunters will love the crisp text and subtle color of this cheap ink jet, but paper trays are weak.

Lexmark's new ink jet gives penny-pinching buyers the best print quality for under $200. Its print quality on ordinary paper at standard resolution is better than that of the Lexmark 5700. Text is a crisp black, with even weights and no jagged edges. The 3200 Color Jetprinter also does a better job on line art than most ink jets do, and it produces bright, subtle, realistic color graphics. On (more expensive) glossy paper, the 3200 prints outstanding graphics that look similar to those produced by our small-business Best Buy, the HP DeskJet 722C.

The 3200 Color Jetprinter prints graphics at about the same speed as the 5700, but it's slower on text, at just 2.1 ppm. And in informal tests, the 3200's high-quality printing proved to be even slower. The 3200 comes with less bundled software than the 5700; the package consists of two home graphics applications, American Greetings' CreataCard and Windows Draw from Micrografx. And it's also more difficult to install, because you have to use the Run command from the Windows Start ▶

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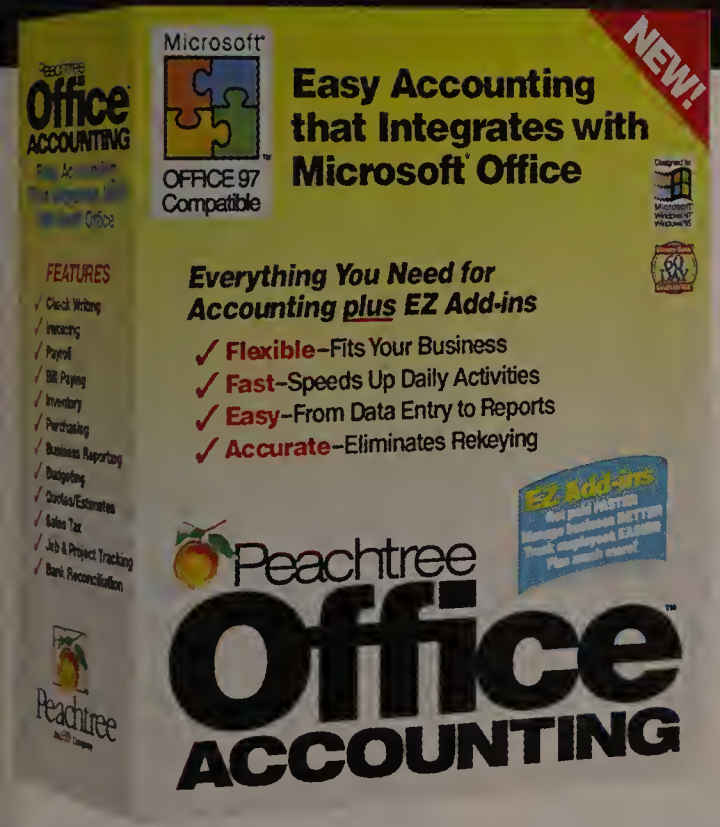

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- 3Com 3C905B 10/100 NIC
- MS IntelliMouse
- ★ *Upgrade to 128MB 100MHz SDRAM, add $60.*
- ★ *Upgrade to a 19" (17.9" viewable, .26dp) 1200HS Monitor, add $79.*

$1999

Business Lease◊: $76/Mo., 36 Mos.
Order Code #591103

DELL DIMENSION V333c
INTEL® CELERON™ PROCESSOR AT 333MHz

Network Designed Desktop

- 64MB SDRAM
- 128KB Integrated L2 Cache
- 8.4GB Ultra ATA Hard Drive
- 17" (15.9" viewable) 1000LS Monitor
- ATI 8MB 3D AGP Graphics
- 32X Max^ Variable CD ROM Drive
- Integrated Intel 10/100 Ethernet Controller
- *NEW* Logitech First Mouse+ (PS/2v)
- ★ *Upgrade to 96MB SDRAM, add $89.*
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NEW DELL DIMENSION XPS R450
PENTIUM II PROCESSOR AT 450MHz

- 128MB 100MHz SDRAM
- *NEW* 17.2GB Ultra ATA Hard Drive
- 21" (19.8" viewable, .26dp) Trinitron 1600HS Monitor
- *NEW* 16MB STB nVidia TNT 3D AGP Graphics Card
- 4.8X DVD-ROM Drive and Decoder Card
- *NEW* Turtle Beach Montego II A3D 320V Sound Card
- ACS-495 Full Dolby Surround Sound Speakers with Subwoofer
- Iomega Zip 100MB Internal Drive
- Dell Comfort Key Keyboard
- MS IntelliMouse

$3299

Personal Lease°: $125/Mo., 36 Mos.°
Order Code #501107

NEW DELL DIMENSION XPS R450
PENTIUM II PROCESSOR AT 450MHz

- 128MB 100MHz SDRAM
- *NEW* 17.2GB Ultra ATA Hard Drive
- *NEW* 19" (18.0" viewable, .26dp) Trinitron P990 Monitor
- 8MB STB nVidia 3D AGP Graphics Card
- 4.8X DVD-RDM Drive and Decoder Card
- Turtle Beach Montego A3D 64V Sound Card
- ACS-295 Speakers with Subwoofer
- Dell QuietKey Keyboard
- MS IntelliMouse

$2699

Personal Lease°: $102/Mo., 36 Mos.
Order Code #501105

DELL DIMENSION XPS R400
PENTIUM II PROCESSOR AT 400MHz

- 96MB 100MHz SDRAM
- *NEW* 12.9GB Ultra ATA Hard Drive
- 17" (15.9" viewable) 1000LS Monitor
- 8MB ATI XPERT 98D 3D AGP Graphics Card
- *NEW* 4.8X DVD-RDM Drive
- Crystal 3D 64V Wavetable Sound
- ACS-295 Speakers with Subwoofer
- Iomega Zip 100MB Internal Drive
- Dell Comfort Key Keyboard
- MS IntelliMouse

$1999

Personal Lease°: $76/Mo., 36 Mos.
Order Code #501109

DELL DIMENSION V333c
INTEL CELERON PROCESSOR AT 333MHz

- 64MB SDRAM
- 8.4GB Ultra ATA Hard Drive
- 17" (15.9" viewable) 1000LS Monitor
- ATI 8MB 3D AGP Graphics
- *NEW* 4.8X DVD RDM Drive
- Yamaha XG 64V Wavetable Sound
- harman/kardon HK-195 Speakers
- Iomega Zip 100MB Internal Drive
- Dell Comfort Key Keyboard
- *NEW* Logitech First Mouse+ (PS/2v)
- ★ *Upgrade to 96MB 100MHz SDRAM, add $89.*

$1599

Personal Lease . $61/Mo., 36 Mos
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- Publisher 98
- Outlook 98
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- Expedia Streets 98

Microsoft Home Essentials 98 includes:
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- Encarta Encyclopedia 98
- Money 98
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- harman/kardon HK-195 Speakers
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- 3-Year NBD On-site^Δ Service
- 7x24 Hardware Telephone Support

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Common features: • 512KB Integrated L2 ECC Cache • Integrated Ultra-2/LVD and Ultra/Narrow SCSI Controllers • 32X Max^ Variable SCSI CD-ROM Drive • HP® OpenView™ NNM Special Edition • 3 External 5.25" Bays plus Dedicated 3.5" Floppy Drive Bay • 7x24 Dedicated Server Hardware Technical Telephone Support

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(DUAL PROCESSOR/RAID CAPABLE)
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- 3-Year Next-Business-Day On-site^Δ Service
- ★ *Second Pentium II Processor at 450MHz, add $1199.*

$4699

Business Lease◊: $173/Mo., 36 Mos.
Order Code #251116

DELL POWEREDGE 2300 SERVER PENTIUM II PROCESSOR AT 350MHz

(DUAL PROCESSOR/RAID CAPABLE)
- 64MB 100MHz ECC SDRAM
- 4GB Ultra-2/LVD SCSI Hard Drive (Hot-Swap Optional)
- Intel Pro/100B PCI Ethernet Adapter
- 6 Expansion Slots: 4 PCI, 2 PCI/ISA
- Internal Hard Drive Bays to Support 4-1.6" or 6-1" Drives
- 3-Year Next-Business-Day On-site^Δ Service
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Business Lease◊: $97/Mo., 36 Mos.
Order Code #251104

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Common features for the Inspiron 7000: • 3D Surround Sound and Hardware Wavetable • Intelligent Lithium Ion Battery • Microsoft Office 97 Small Business Edition v2.0 • Microsoft Windows 98 • S-Video Port • Touchpad **Common features for the Inspiron 3500/3200:** • 3D Surround Sound and Software Wavetable • Modular 3.5" Floppy Drive • Modular 24X Max^^ Variable CD-ROM • Intelligent Lithium Ion Battery • Microsoft Office 97 Small Business Edition v2.0 • Microsoft Windows 98 • Touchpad

DELL INSPIRON 7000 D300LT PENTIUM II PROCESSOR AT 300MHz

All-in-One Multimedia Performance
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- Deluxe Nylon Case
- Internal 56K Capable™ V.90 Fax Modem
- 3-Year Limited Warranty†
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$3899

Business Lease◊: $148/Mo., 36 Mos.
Order Code #891101

DELL INSPIRON 7000 D300LT PENTIUM II PROCESSOR AT 300MHz

All-in-One Multimedia Performance
- 15" XGA Active Matrix Display
- 64MB SDRAM (384MB Max*)
- 4GB Ultra ATA Hard Drive
- Removable Combo 24X Max^^ Variable CD-ROM and 3.5" Floppy Drive
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- 3-Year Limited Warranty†
- ★ *Upgrade to 96MB SDRAM, add $99.*
- ★ *Custom Leather Case, add $99.*

$2999

Business Lease◊: $114/Mo., 36 Mos.
Order Code #891103

NEW DELL INSPIRON 3500 D266GT PENTIUM II PROCESSOR AT 266MHz

Lightweight, Light Price Notebook
- 14.1" XGA Active Matrix Display
- 64MB SDRAM (256MB Max)
- 4GB Ultra ATA Hard Drive
- NeoMagic MediaMagic 256AV AGP Video
- Internal 56K Capable™ V.90 Fax Modem
- 3-Year Limited Warranty†
- ★ *Upgrade to a 6.4GB Ultra ATA Hard Drive, add $199.*
- ★ *Iomega Zip 100MB Internal Drive, add $159.*
- ★ *Second Intelligent Lithium Ion Battery, add $129.*

$2649

Business Lease◊: $100/Mo., 36 Mos.
Order Code #891105

DELL INSPIRON 3200 D233XT PENTIUM II PROCESSOR AT 233MHz

- 13.3" XGA Active Matrix Display
- 32MB SDRAM (144MB Max)
- 3.2GB Ultra ATA Hard Drive
- NeoMagic 128-bit Graphics Accelerator
- Extendable 1-Year Limited Warranty†
- ★ *Upgrade to 48MB SDRAM, add $49.*
- ★ *Upgrade to a 4GB Ultra ATA Hard Drive, add $99.*
- ★ *56K Capable™ x2 Modem, add $99.*
- ★ *Iomega Zip 100MB Internal Drive, add $159.*
- ★ *Upgrade to a 3-Year Limited Warranty†, add $149.*

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menu. Finally, the 3200—and especially its paper tray—isn't as sturdy as the 5700. The 3200's software interface, like the 5700's, is simple to use, with a useful selection of controls such as half-toning, saturation, brightness, and color. • **Lexmark International; 800/539-6275; www.lexmark.com**

INFONET NO. 617

6 Epson Stylus Color 1520

STREET PRICE: $799

SUMMARY: The Stylus Color is a good choice for offices that need to print large documents (up to 13 by 19 inches) quickly—and are willing to spend extra for the privilege.

Not many noncommercial printers can handle the extralarge print sizes necessary for, say, brochures that fold into thirds. Enter Epson's wide-format ink jet, the Stylus Color 1520. For its admittedly steep $799 price, the printer offers 13-by-19-inch printing; the second-fastest text speed among the ink jets reviewed in this roundup; and extensive options, including the ability to be networked. Photographs printed at the highest resolution on special film look even better than the Epson Stylus Photo 700's, with breathtakingly bright colors, exquisite textures, and realistic graphics. (The film costs about $6 a sheet, but that's a bargain compared to the $75 to $100 you'd spend at a service bureau to get equivalent output.)

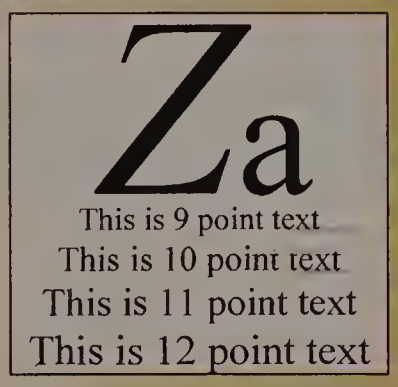
The Stylus Color 1520 is also a good printer for everyday use; on ink jet paper at a more down-to-earth 720 dpi, it produces very black, clean text that could almost be mistaken for laser output. Gray-scale images are rich, with smooth shading and sharp details. Color prints also stand out, with realistic shades and smooth transitions.

The 1520 loses its edge on ordinary paper in its default 360-dpi mode. Text looks jagged, and colors, though still good, lack the subtlety of those produced by the HP DeskJet 722C. But the default mode is fine for drafts, since it produces text at a zippy 3.3 ppm and graphics at 1.5 ppm (that's two to three times the graphics speed of most other ink jets). The 1520 offers a lot of paper-handling options, including a tractor feed for preprinted forms. The 100-sheet paper tray can hold paper as large as 17 ▶

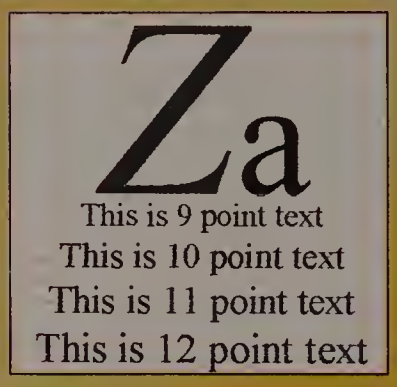
PICKS AND PANS
New Printers Missed the Boat

WE EXPECTED TO SEE a huge range in print quality among the printers we tested this month, but technology has advanced to a point where that's just not so. Among the printers that made our chart, the best ones excelled, but the lower-ranked models weren't so bad either. On the other hand, some of the printers that fell short of our Top 10 really missed the boat, producing fuzzy text and unrealistic colors.

SMALL-BUSINESS/HOME PRINTERS



BEST Dark, crisp text with no shadowing is the hallmark of the Lexmark 3200 Color Jetprinter.

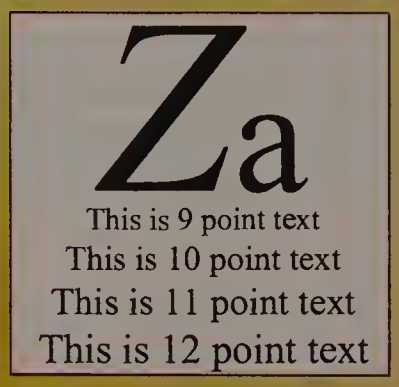


WORST The NEC Super-Script 650C produces text characterized by gritty edges and little detail.

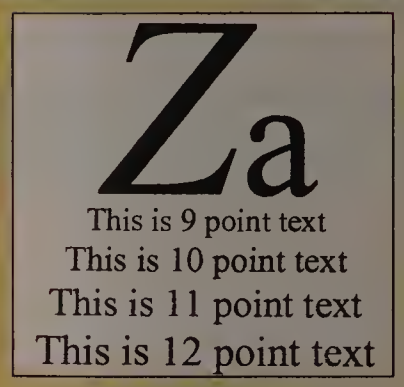
BEST The HP DeskJet 722C's images are detailed and smooth, even if colors are just a bit washed out.

WORST The color coming out of Okidata's Okijet 2500 looks bleached, as if the page had been left in the sun.

CORPORATE PRINTERS



BEST Any corporation would be happy with the precise, even text of the Minolta Color PageWorks PS.



WORST You'll get decent text from the Lexmark Optra SC 1275, but the letters might look somewhat thick.

BEST The QMS Magicolor 2 CX produces subtle, lifelike colors—better than those of any other laser we've seen.

WORST The Konica KL-3015 Force Color prints good-looking hues, but images lack detail and smooth transitions.

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*"The Top 10 PC Manufacturers Worldwide Rankings," by IDC Consulting, March 1998. **These AcerPower systems are preloaded with Windows 98, but can be reformatted with Windows 95 that is included on the Acer Resource CD. Acer desktop and notebooks bundle with Microsoft® Windows® 95 or Windows 98. Acer S-series servers bundle with Microsoft BackOffice® Small Business Server. ©1998 Acer America Corporation. Acer, the Acer logo, AcerAltos and Extensa are registered trademarks and AcerPower is a trademark of Acer America Corporation and Acer Inc. Intel, the Intel Inside logo and Pentium are registered trademarks, and Celeron are trademarks of Intel Corporation. Microsoft, Windows and BackOffice are registered trademarks of Microsoft Corporation. All other company and/or product names are property of their respective trademark owners.

by 22 inches. You can network the 1520 with an external print server, but its paper tray is flimsier than we'd like. • **Epson America; 800/463-7766; www.epson.com**

7 Canon BJC-4400

STREET PRICE: $179

SUMMARY: Low price and small size help put the 4400 on the chart, but average print quality keeps it at the bottom.

Canon's BJC-4400 isn't as flashy and doesn't print as nicely as the company's BJC-5000, but it prints at similar speeds and has some of the same useful features—for $70 less. One of the 4400's unique features is an oversize black cartridge, which prints long text documents about twice as fast as the typical set of ink cartridges and reduces the chances of running dry in the middle of a job, much like the 5000's mix-and-match cartridge scheme. And as with the 5000, you can transform the 4400 into a scanner by pulling out the printhead and snapping in Canon's $99 IS-22 scanhead.

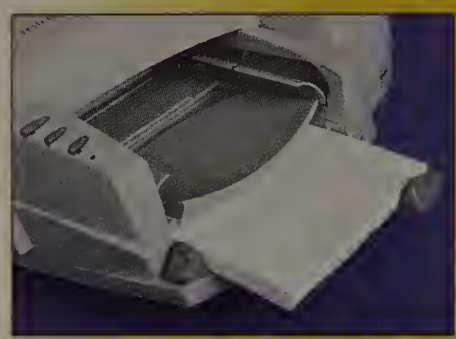
Home users who are pressed for space will appreciate the Canon BJC-4400's size, which is more compact than the BJC-5000's. Too bad about the 4400's print quality. The printer is perfectly fine for personal letters, but you wouldn't want to print your résumé on it. Normal-size text has rough edges, and larger fonts are distorted. Although graphics look somewhat better, revealing good detail, their colors lack subtlety. • **Canon Computer Systems; 800/652-2666; www.ccsi.canon.com**

INFONET NO. 618

Loved It, Hated It

NO PRINTER IS PERFECT; most combine virtues and flaws. Here's one great feature for small offices—and one home printer shortcoming.

SMALL BUSINESS



HP's 2000Cse has an optional 250-sheet paper tray—a handy addition for busy offices.

HOME

Don't let your pet—or kids—get near the Lexmark 3200 Color Jetprinter's flimsy paper tray.

TEST REPORT

Quick Color Graphics Hard to Come By

Laser speeds sear the competition, but HP DeskJet and Epson Stylus Color ink jets print fast text.

		PRINTER	Text only ppm	Text only Printing test times	Mixed text and graphics ppm	Mixed text and graphics Printing test times	Full-page graphics ppm	Full-page graphics Printing test times	Batch test Pass/fail
Small-business/home	1	HP DeskJet 722C*	4.1		0.6		0.3		n/a
	2	Epson Stylus Photo 700	1.3		1.1		0.4		n/a
	3	Canon BJC-5000*[1]	2.3		0.6		0.4		n/a
	4	Lexmark 5700 Color Jetprinter[1]	2.9		0.7		0.3		n/a
	5	Lexmark 3200 Color Jetprinter[1]	2.1		0.8		0.4		n/a
	6	Epson Stylus Color 1520	3.3		2.0		1.2		n/a
	7	Canon BJC-4400[1]	2.1		0.7		0.4		n/a
Corporate	1	Lexmark Optra SC 1275*	7.5		2.5		0.5		pass
	2	Minolta Color PageWorks PS	6.0		1.3		0.4		pass
	3	QMS Magicolor 2 CX	9.7		1.8		0.5		pass

Faster — Printing test times; Minutes 0 10 20

*Best Buy n/a = not applicable

Ten-page text; Ten-page text (draft); Five-page spreadsheet; Two-page text; Two-page spreadsheet; Downloaded Web page; Gray-scale photo; Five-page presentation; Color photo #1; Color photo #2

TEST PC WORLD CENTER

HOW WE TEST All printers are tested in default mode under Windows 95 using a Gateway P5-166MMX with 32MB of RAM. Tests are timed from the point when the print command is issued until the last sheet is out of the printer. Test documents include ten pages of plain text and a two-page newsletter created using Word 97 SR-1 for Windows 95; a five-page plain spreadsheet and a two-page spreadsheet with a color pie chart created using Excel 97 SR-1 for Windows 95; the contents of an HTML page from a Web site; a five-page color presentation created in Lotus Freelance Graphics 97 Edition; a color photograph created in Adobe Photoshop 5.0 and printed in both color and gray-scale; and a color photograph created in CorelDraw 8.369. Data based on tests designed and conducted by the PC World Test Center. All rights reserved. [1]Recommended for home.

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Performance data: Ziff-Davis WinBench 98 High-End Disk WinMark score, running in Windows NT® on a 300MHz Pentium II with 64MB of RAM.*

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Corporate PRINTERS

For a busy office that prints a lot of color pages, a color laser is a must. These printers cost much more than even the priciest ink jet—the average laser costs $3100, versus $300 for the average small-office ink jet. But lasers print up to twice as fast on text and three times as fast on graphics. And color lasers offer options that are still rare among ink jets, including networking, additional paper trays, large paper input bins, sturdy designs, toner cartridges that last for thousands (rather than hundreds) of pages, and extra memory for complex print jobs. As color laser prices continue to drop—we've watched them get closer to $2000 over the last six months—a wider range of businesses will be able to afford them. Do these color models replace monochrome lasers? Not quite. You can still get a black-and-white printer for under $1000 that outperforms any color laser. Color models average about 8 ppm on text, while the monochrome Lexmark Optra S 1625, for example, costs $999 and prints text at 11.7 ppm.

1 Lexmark Optra SC 1275

STREET PRICE: $2999

SUMMARY: Quick speeds, extensive options, and a fair price make this a great choice for busy offices. Color prints are a bit bright, however.

Lexmark's Optra SC 1275 is a fine all-around office laser. Although it uses the same engine as the runner-up Minolta Color PageWorks PS, it's much speedier—25 percent faster on both text and graphics, at 7.5 ppm and 0.5 ppm, respectively.

What you gain in speed, you ultimately lose in print quality. The Optra SC 1275's output is a bit less attractive than the Minolta's, but it's still good, with solid (if a bit thick) text, and graphics that are just slightly marred by a too-regular texture and overly bright colors.

The Lexmark's features, software, and design are impressive. Like most color laser printers, it can't print in color on legal-size paper. But unlike most, it can print color labels. The Lexmark Optra SC 1275 comes with a 250-sheet paper tray (a second 250-sheet tray lists for $339) and a 150-sheet multipurpose tray. Newly redesigned print software makes operating the printer easier than before, and the on-board control panel is clear as a bell. Built-in handles enable two people to lift the hefty 77-pound block, and getting inside to replace consumables or clear paper jams is straightforward. The printer supports a disk drive for caching print jobs and fonts, and an infrared port that allows a notebook user to send a print job without plugging in to the network or attaching any wires.

• **Lexmark International; 800/539-6275; www.lexmark.com**

INFONET NO. 619

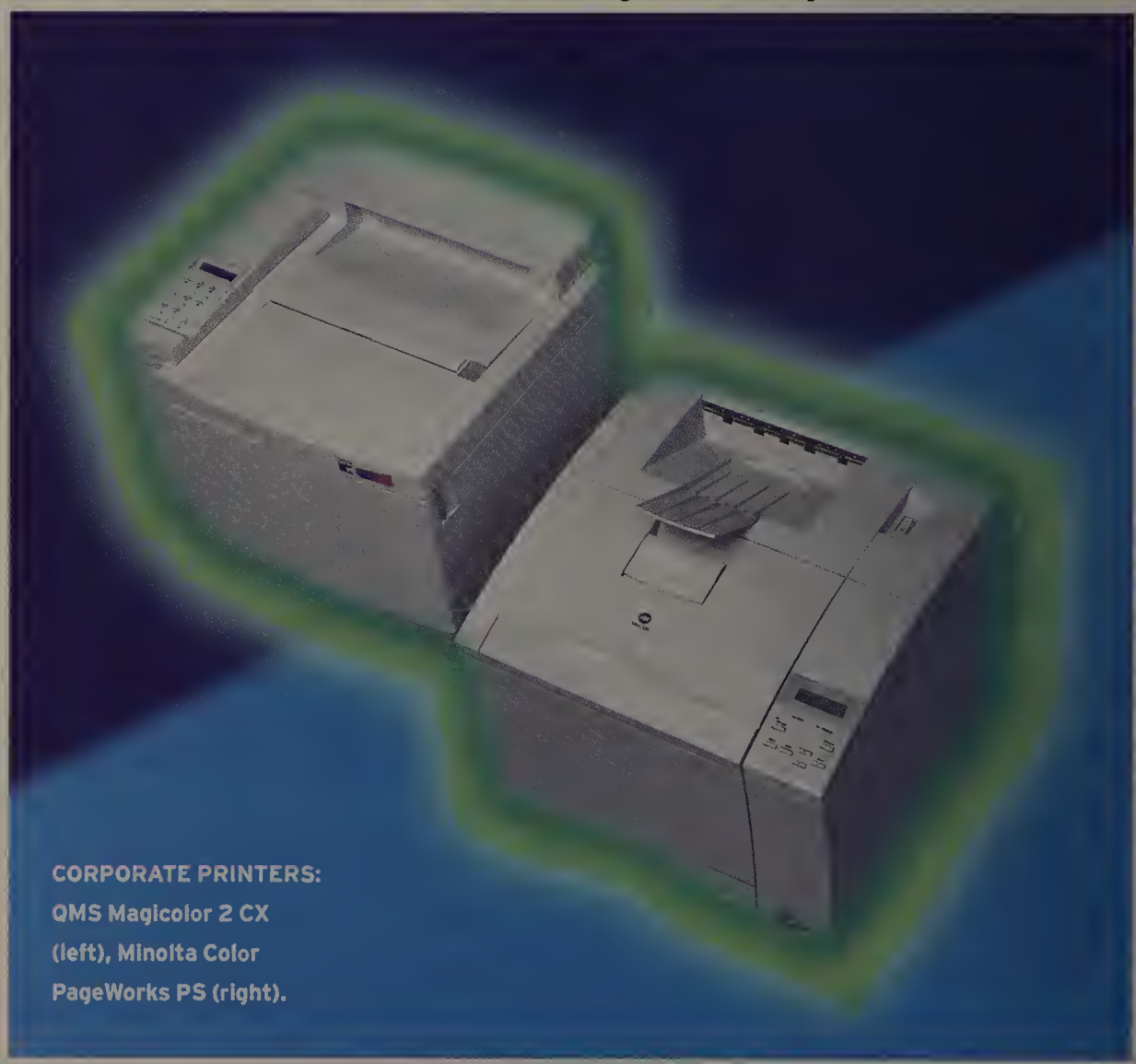
2 Minolta Color PageWorks PS

STREET PRICE: $3299

SUMMARY: If print quality is paramount, you'll especially like the Minolta's text output. Very good paper-handling features also help balance this well-designed color laser's slow speeds.

In the case of Minolta's Color PageWorks PS, good print quality is worth waiting for. Though it's slower than the Lexmark, its output is superior. The Color PageWorks PS prints clean, even, black text, and detailed (if slightly grainy) color. But the Minolta churns out text at just 6 ppm and graphics at 0.4 ppm, placing it last in both categories among the laser printers here.

Minolta's manual gives detailed explanations of the control ▶



CORPORATE PRINTERS: QMS Magicolor 2 CX (left), Minolta Color PageWorks PS (right).

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panel menus, and the troubleshooting section is helpful. On the other hand, it could better explain how to work the driver's settings for printing photos, matching colors, and so on. We also had trouble with a glitchy software installation. • **Minolta; 888/264-6658; www.minoltaprinters.com**

INFONET NO. 620

3 QMS Magicolor 2 CX

STREET PRICE: $3200

SUMMARY: Stunning color graphics, fast text, and easy setup offset by frustrating instructions and control panel menus.

QMS's Magicolor 2 CX is the color laser for offices willing to trade ease of use for speed. Its 9.7-ppm text speed beats the Lexmark Optra SC's by almost 30 percent. (On graphics, the QMS matches the Lexmark, at 0.5 ppm.) The Magicolor prints clean, black text, and subtle, realistic color graphics that were better than any we'd seen in some time.

But QMS could have made the control panel simpler; with its lights and buttons arranged like a periodic table, we found it hard to use. Printed documentation is limited to a quick-start manual, and online help is confusing. Furthermore, you have to remove the regular paper to use the auxiliary tray.

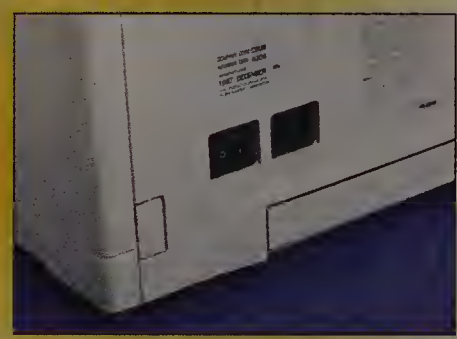
On the plus side, the printer is especially easy to set up: Toner cartridges slide into place like chest drawers, and the imaging drum moves straight up and down for easy removal. For $1600, you can add a scanner/document feeder that effectively turns the Magicolor into a color copier. • **QMS; 800/523-2696; www.qms.com**

INFONET NO. 621

Loved It, Hated It

JUST BECAUSE YOU PAY a bundle for a color laser doesn't mean it'll be flawless. Below, one good and one bad feature among corporate printers.

Toner cartridges for the QMS Magicolor 2 CX are especially easy to replace—they slide in easily, like drawers in a bureau.



You'll need long arms to reach the Xerox DocuPrint C55mp's power switch, which is located on the back of the big 90-pound printer.

online

For reviews of six additional color printers, point your Web browser to PC World Online at www.pcworld.com/dec98/printers. Dan Littman is a freelance writer. Karen Silver is a senior associate editor for PC World. *Testing was performed by Ulrike Diehlmann, Robert James, and Sean Tieu of the PC World Test Center.*

For more information about all products in this article, select InfoNet no. 901 on the product information card or visit PC World Online at www.pcworld.com/infonet. ■

Help Me, Please: Printer Makers Offer Spotty Tech Support

NEED A HELPING HAND? Don't count on your printer vendor. We made three calls to each of the companies below and asked one easy, one moderate, and one difficult technical question. Not one company excelled at answering our queries quickly, accurately, and thoroughly—with a smile. Epson and Xerox came the closest, while NEC was the worst. When you really need help, be persistent: Ask for more information if necessary. And don't tolerate a rude representative; there's probably a nicer one on another line. —Karen Silver

COMPANY	Responsiveness	Courteousness	Accuracy	Thoroughness	Overall	Comments
Canon	B	B	A	C	**B**	Canon's representatives knew their stuff, but like most, they didn't go out of their way to offer extra help.
Epson	A	A	B	C	**B**	We received friendly service from Epson, though its reps gave us just enough information to squeak by.
Hewlett-Packard	A	A	D	D	**C**	HP's patient, quick-answering representatives missed some simple solutions to our problems.
Konica	A	C	F	D	**D**	We got an answer on the first ring from Konica; unfortunately, it wasn't quite as easy to get a correct answer.
Lexmark	C	B	B	B	**B**	Lexmark's tech support was just adequate all around: courteous enough, fairly accurate, and reasonably thorough.
Minolta	A	B	B	C	**B**	Similar to Lexmark's, Minolta's reps did fine in most respects; unlike Lexmark's, they picked up the phone quickly.
NEC	A	F	F	F	**F**	The worst on our chart, NEC's representatives were condescending, inaccurate, and brusque.
Okidata	C	A	B	D	**C**	Okidata's responses were mixed: Some reps were on the ball, while others were abrupt and wrong.
QMS	C	A	D	D	**C**	The representatives at QMS were professional and personable, but they weren't the best informed.
Xerox	C	A	A	B	**B**	Xerox's tech support folks were among the most accurate; we would have liked them more if they'd offered more than just the basic information.

Quantex customers are happier than IBM, Gateway, or Micron customers.[1]

Are you?

[1]Results based on a Windows Magazine (Aug. '97) 'Technical Support Survey' in which Quantex received a 91% 'Buy Again Rating,' higher than that received by IBM, Micron and Gateway and on PC Magazine (July '98) 'Service and Reliability Survey' in which Quantex received the highest ratings for its customers' 'Tech Support Experience' in 4 out of 5 categories including 'tech was knowledgeable, tech tried everything to help, prompt resolution and got a run-around.' Calculations based on 25 vendors evaluated in the survey.

It's about time you

Quantex systems feature the Intel® Pentium® II processor

Today, Quantex is one of the world's largest direct marketers of computer systems, featuring the Intel® Pentium® II processor. And in the last year, Quantex has consistently placed at or near the top in surveys of customer satisfaction and tech support. As well as winning dozens of product rating awards in the most respected publications.

As more businesses and experts say good things about Quantex, you're bound to wonder, "How good can they be?" There's one way to find out.

DELL NUDGES OUT QUANTEX BY 1% FOR CUSTOMER SATISFACTION. QUANTEX CUSTOMERS VERY HAPPY. MANAGEMENT NOT[1].

OK. We may not be number one in total customer satisfaction yet, but we're real close. And we can do better. That's why so many people who have bought Quantex say they'll buy Quantex again. And do. And they tell others. How else could we get this big when most people still don't even know our name?

WOULD YOU BUY AGAIN?

Vendor	% who would buy the same brand
Dell	92%
Quantex	**91%**
IBM	89%
Micron	81%
Gateway	80%
Acer	74%
Digital	69%
Toshiba	61%
Compaq	58%
Packard Bell	51%

Windows Magazine, 8/97

QUANTEX RATED NUMBER ONE IN TECH SUPPORT. #2-#25 NEED TO TRY HARDER[2].

In the most recent *PC Magazine* study, PC owners rated Quantex the leader for tech support based on their own experiences. For the technical knowledge of our people and the promptness of the resolution, no one beat Quantex. And no one came within 10 points

COMPUTER SHOPPER 1997 Direct Channel Achievement Award

PC COMPUTING 1997 Mast Valuable Praduct Award

PC COMPUTING 5 Star Rating (11/98)

PC COMPUTING 5 Star Rating (10/98)

PC WORLD Best Buy Award (10/98)

PC WORLD Best Buy Award (9/98)

PC WORLD #1 Best Buy Award (8/98)

PC WORLD #1 Best Buy Award (7/98)

[1]Results based on a Windows Magazine (Aug. '97) "Technical Support Survey" in which Quantex received a 91% "Buy Again Rating," higher than that received by IBM, Micron and Gateway.

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for "tech tried everything to help." Not Dell. Not Gateway. Not Micron. Not IBM. Not Compaq.

Hey, we may not be a household name yet. So we go the extra mile. And our customers notice it.

TECH SUPPORT EXPERIENCE

Vendor	Tech was knowledgeable	Tech tried everything to help	Prompt resolution	Got a run-around
Quantex	**57%**	**59%**	**49%**	**9%**
Micron	56%	47%	43%	9%
Gateway	54%	48%	45%	10%
Dell	54%	43%	49%	10%
IBM	41%	33%	36%	15%
Compaq	37%	30%	30%	17%
Average*	**40%**	**33%**	**32%**	**16%**

"Service and Reliability Survey," PC Magazine, July 1998
* calculations based on all 25 PC vendors evaluated in the survey.

QUANTEX SYSTEMS KEEP WINNING. COMPETITION AT A LOSS.

Obviously, it takes a lot more than great support to generate great customer satisfaction. And more than VERY competitive prices. It takes great computers featuring the Intel Pentium® II processor. And Quantex configures them with industry-standard "enhancements" that make Quantex systems regular winners in the "best buy" category.

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C|NET ONLINE Editors' Choice Award (8/98)

C|NET ONLINE Editors' Choice Award (6/98)

PC PORTABLES Best Buy Award (3/98)

PC COMPUTING 4-star "Tarture Test" Survivar (4/98)

PC COMPUTING 4-star Rating (9/98)

*Results based on PC Magazine (July '98) "Service and Reliability Survey" in which Quantex received the highest ratings for its customers' "Tech Support Experience" in 4 out of 5 categories including "tech was knowledgeable, tech tried everything to help, prompt resolution and got a run-around." Calculations based on 25 vendors evaluated in the survey.

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Quantex Business Desktops bring enterprise management technology, traditionally implemented by large corporations, to businesses of all sizes–including yours. Built according to industry-standard initiatives such as Wired for Management, DMI 2.0, PC 98, LDCM and ACPI, these desktops are designed to lower your total cost of ownership. They also incorporate capabilities for improved asset management and remote configurations and diagnostics. Plus, our innovative **QSentry technology** assures unsurpassed confidence and security by constantly monitoring the health of Quantex PCs. If you want to do something more productive, install Quantex Business Desktops. **Starting at just $999**

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Looking to provide your business with a better view? Quantex gives it to you with its state-of-the-art 15" LCD flat-panel monitors with on-screen controls. Engineered with advanced technologies, these active matrix TFT flat-panels produce clear, crisp pictures with bright vivid colors, and include landscape and portrait modes. All this while saving approximately 75% of the desk space and up to 70% of the power used by traditional CRT's. *Available as upgrade only.*

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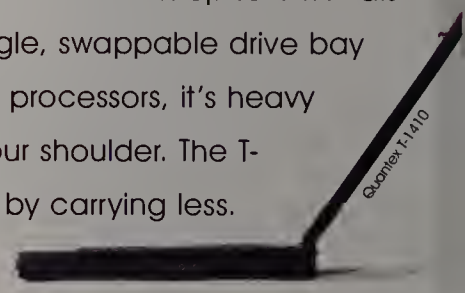

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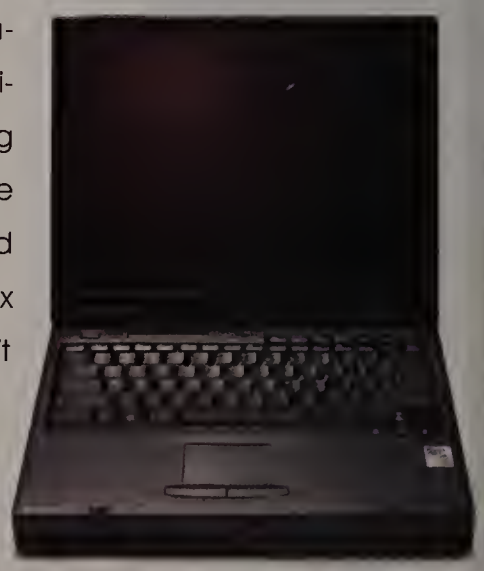

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- MS Windows 98 w/Microsoft Plus 98
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- 8.4G8 Ultra ATA HD / 3.5" 1.44M8 Floppy Drive
- 17" Digital Monitor w/OSD & NEC CromaClear CRT (16.0" viewable; .25 dp; 1600x1200 max. resolution)
- Intel740™ 3D 2X AGP Graphics with 8M8 SDRAM
- *New* Intel Pro 10/100 PCI Ethernet Controller w/RJ-45 and Wake-On-LAN Technology
- 32X Max EIDE CD-ROM Drive
- 2 Universal Serial Bus (USB) Ports / DMI 2.0
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS IntelliMouse
- MS Windows NT 4.0 Workstation
- Microsoft Office '97 SBE v2.0
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- Pentium® II processor 233MHz
- Intel Mobile Module (I.M.M.) Architecture
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- 13.3" XGA Active Matrix Display
- 32M8 SDRAM / 512K8 Secondary Cache
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- 56K V.90 Fax/Modem*
- 24X Modular CD-ROM Drive / 3.5" Modular Floppy Drive
- *New* NeoMagic NMG5 128-bit AGP Video
- Integrated 16-bit Stereo Sound and Speakers
- Smart Lithium Ion Battery
- USB and Fast IR Ports / Integrated Personal Touchpad
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- 3-year limited warranty on CPU and Main Memory
- 1-year parts and labor limited warranty on all other components

T-1310 w/Pentium II processor 266MHz.....$2199

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Business lease: $88/Mo.

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- Intel Mobile Module (I.M.M.) Architecture
- *New* Ultra-Thin Design (12.44"x9.84"x1.43")
- 14.1" XGA Active Matrix Display
- 64M8 SDRAM / 512K8 Secondary Cache
- 4G8 Ultra ATA HD
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- *New* NeoMagic NMG5 128-bit AGP Video
- Integrated 16-bit Stereo Sound and Speakers
- Smart Lithium Ion Battery
- Mini-Docking Station
- USB and Fast IR Ports / Integrated Personal Touchpad
- MS Windows 98 / Microsoft Office '97 SBE v2.0
- Quantex Carrying Case
- 3-year limited warranty on CPU and Main Memory
- 1-year parts and labor limited warranty on all other components

T-1400 w/Pentium II processor 300MHz.....$2699

Quantex T-1410 $2849

Business lease: $100/Mo.

- Pentium® II processor 300MHz
- Intel Mobile Module (I.M.M.) Architecture
- *New* Ultra-Thin Design (12.44"x9.84"x1.43")
- 14.1" XGA Active Matrix Display
- 80M8 SDRAM / 512K8 Secondary Cache
- 6G8 Ultra ATA HD
- 56K V.90 Fax/Modem*
- *New* 2X Modular DVD-ROM Drive & 3.5" Floppy Drive
- *New* NeoMagic NMG5 128-bit AGP Video
- Integrated 16-bit Stereo Sound and Speakers
- Smart Lithium Ion Battery
- USB and Fast IR Ports / Integrated Personal Touchpad
- MS Windows 98
- Microsoft Office '97 SBE v2.0
- Quantex Carrying Case
- 3-year limited warranty on CPU and Main Memory
- 1-year parts and labor limited warranty on all other components

Quantex T-1411 $3099

Business lease: $104/Mo.

- Pentium® II Processor 300MHz
- Intel Mobile Module (I.M.M.) Architecture
- *New* Ultra-Thin Design (12.44"x9.84"x1.43")
- 14.1" XGA Active Matrix Display
- 96M8 SDRAM / 512K8 Secondary Cache
- 6G8 Ultra ATA HD
- 56K V.90 Fax/Modem*
- *New* 2X Modular DVD-ROM Drive & 3.5" Floppy Drive
- *New* NeoMagic NMG5 128-bit AGP Video
- Integrated 16-bit Stereo Sound and Speakers
- Two Smart Lithium Ion Batteries
- Mini-Docking Station
- USB and Fast IR Ports / Integrated Personal Touchpad
- MS Windows 98 / Microsoft Office '97 SBE v2.0
- Quantex Carrying Case
- 3-year limited warranty on CPU and Main Memory
- 1-year parts and labor limited warranty on all other components

Quantex I-1400 $2299

Business lease: $81/Mo.

- Pentium® II processor 266MHz
- Intel Mobile Module (I.M.M.) Architecture
- 14.1" XGA Active Matrix Display
- 64M8 SDRAM / 512K8 Secondary Cache
- 4G8 Ultra ATA HD
- 56K V.90 Fax/Modem*
- Removable 24X CD-ROM Drive & 3.5" Floppy Drive
- *New* ATI Rage Lt Pro 3D AGP Video w/8M8
- *New* ESS 3D Wavetable Surround Sound and Speakers
- *New* Long-Lasting 12-Cell Smart Lithium Ion Battery
- USB and Fast IR Ports / Integrated Personal Touchpad
- MS Windows 98 / Corel Office Suite 8
- Quantex Carrying Case
- 3-year limited warranty on CPU and Main Memory
- 1-year parts and labor limited warranty on all other components

I-1400 w/Pentium II processor 300MHz $2549

Quantex I-1411 $3399

Business lease: $114/Mo.

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- Intel Mobile Module (I.M.M.) Architecture
- 14.1" XGA Active Matrix Display
- 128M8 SDRAM / 512K8 Secondary Cache
- 8G8 Ultra ATA HD
- 56K V.90 Fax/Modem*
- *New* Removable 2X DVD-ROM Drive & 3.5" Floppy Drive
- *New* ATI Rage Lt Pro 3D AGP Video w/8MB
- *New* ESS 3D Wavetable Surround Sound and Speakers
- *New* Two Long-Lasting 12-Cell Smart Lithium Ion Batteries
- Mini-Docking Station
- USB and Fast IR Ports / Integrated Personal Touchpad
- MS Windows 98 / Microsoft Office '97 SBE v2.0
- Quantex Carrying Case
- 3-year limited warranty on CPU and Main Memory
- 1-year parts and labor limited warranty on all other components

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QP6/333 M-1c $1099

Business lease: $39/Mo.
- Intel® Celeron™ Processor 333MHz
- 64MB SDRAM Memory / 128KB Secondary Cache
- 6.4GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 15" Digital Monitor (13.8" viewable)
- 64-Bit 3D PCI Graphics Accelerator with 4MB
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- 32X Max EIDE CD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
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- Value Multimedia Software Bundle
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QP6/333 M-1x(with Pentium II processor).....$1179
QP6/350 M-1x(with Pentium II processor).....$1249

QP6/350 M-2x $1449

Business lease: $51/Mo.
- Pentium® II Processor 350MHz/100MHz Front Side Bus
- 64MB SDRAM Memory / 512KB Secondary Cache
- 8.4GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 17" Digital Monitor w/OSD (15.8" viewable)
- Toshiba MPACT2 3D Media Accelerator w/8MB RDRAM
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- *New* 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altec-Lansing ACS-90 Speakers
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS Mouse
- MS Windows 98 w/Microsoft Plus 98
- Value Multimedia Software Bundle
- 3-year limited warranty with 1-year On-Site Service**

QP6/333 M-2x(with Pentium II processor).....$1399
QP6/400 M-2x(with Pentium II processor).....$1599

QP6/400 M-3x $1699

Business lease: $60/Mo.
- Pentium® II Processor 400MHz/100MHz Front Side Bus
- 64MB PC100 SDRAM Memory / 512KB Secondary Cache
- 10.2GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 17" Digital Monitor w/OSD (15.8" viewable)
  Upgrade to 17" Monitor w/NEC CromaClear CRT for $79
- Toshiba MPACT2 3D Media Accelerator w/8MB RDRAM
- Internal 100MB Zip Drive with one cartridge
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- *New* 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altec-Lansing ACS-90 Speakers
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS Mouse
- MS Windows 98 w/Microsoft Plus 98
- Value Multimedia Software Bundle
- 3-year limited warranty with 1-year On-Site Service**

QP6/350 M-3x(with Pentium II processor).....$1549
QP6/450 M-3x(with Pentium II processor).....$1899

QP6/450 M-4x $2049

Business lease: $72/Mo.
- Pentium® II Processor 450MHz/100MHz Front Side Bus
- 96MB PC100 SDRAM Memory/512KB Secondary Cache
- 10.2GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 19" Monitor w/OSD (18.1" viewable), 1600x1200, .26dp
- Intel740™ 3D 2X AGP Graphics with 8MB SDRAM
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- *New* 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altec-Lansing ACS-90 Speakers
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS Mouse
- MS Windows 98 w/Microsoft Plus 98
- Value Multimedia Software Bundle
- 3-year limited warranty with 1-year On-Site Service**
- *Add Altec Lansing ACS-251 Subwoofer for $39*
- *Upgrade to 15.0" LCD Flat-Panel Display for $399*

QP6/400 M-4X(with Pentium II processor).....$1849

POWER MULTIMEDIA

SOFTWARE: MS Office '97 Small Business Edition v2.0 • MS Money '97 (pre-loaded only) • Office Mate • Day Planner Pro • Power Business Plans • Form Designer Pro • Project Manager Pro • Labels Unlimited • Compton's Reference Collection • Dr. Solomons Find-Virus (pre-loaded only) • MS Internet Explorer 4.0
MS Plus 98: McAfee VirusScan, File Cleaner, Start Menu cleaner, Compressed Folders, Deluxe CD Cleaner, MS Pictures It! Express, Lose your marbles, Spider Solitaire, Golf 1998 lite, Desktop Theme

QP6/350 SM-1x $1499

Business lease: $53/Mo.
- Pentium® II Processor 350MHz/100MHz Front Side Bus
- 64MB PC100 SDRAM Memory / 512KB Secondary Cache
- 10.2GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 17" Digital Monitor w/OSD (15.8" viewable)
  Upgrade to 17" Monitor w/NEC CromaClear CRT for $79
- Intel740™ 3D 2X AGP Graphics with 8MB SDRAM
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- 32X Max EIDE CD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altec-Lansing ACS-90 Speakers
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS IntelliMouse
- MS Windows 98 w/Microsoft Plus 98
- Power Multimedia Software Bundle
- Microsoft Office '97 SBE v2.0
- 3-year limited warranty with 1-year On-Site Service**

QP6/400 SM-1x(with Pentium II processor).....$1649

QP6/400 SM-2x $1899

Business lease: $67/Mo.
- Pentium® II Processor 400MHz/100MHz Front Side Bus
- 96MB PC100 SDRAM Memory / 512KB Secondary Cache
- 13.5GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 17" Digital Monitor w/ OSD & NEC CromaClear CRT (16.0" viewable; .25 dp; 1600x1200 max. resolution)
- *New* 3Dfx 128-bit Voodoo Banshee 3D AGP Video w/16MB Based on award-Winning Voodoo2 3D Technology
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- *New* 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altec-Lansing ACS-45.1 Speakers with subwoofer
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS IntelliMouse
- MS Windows 98 w/Microsoft Plus 98
- Power Multimedia Software Bundle
- Microsoft Office '97 SBE v2.0
- 3-year limited warranty with 1-year On-Site Service**
- *Upgrade to 15.0" LCD Flat-Panel Display for $549*

QP6/350 SM-2x(with Pentium II processor).....$1749
QP6/450 SM-2x(with Pentium II processor).....$2049

QP6/400 SM-3x $2149

Business lease: $75/Mo.
- Pentium® II Processor 400MHz/100MHz Front Side Bus
- 128MB PC100 SDRAM Memory / 512KB Secondary Cache
- 13.5GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 19" Monitor w/OSD (18.1" viewable), 1600x1200, .26dp
- *New Ultra-Fast #9* Revolution IV 128-bit 3D 2X AGP Graphics w/32MB
- Internal 100MB Zip Drive with one cartridge
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- 32X Max EIDE CD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altec-Lansing ACS-45.1 Speakers with subwoofer
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS IntelliMouse
- MS Windows 98 w/Microsoft Plus 98
- Power Software Bundle / Microsoft Office '97 SBE v2.0
- 3-year limited warranty with 1-year On-Site Service**
- *Upgrade to 15.0" LCD Flat-Panel Display for $399*

QP6/350 SM-3x(with Pentium II processor).....$1999
QP6/450 SM-3x(with Pentium II processor).....$2299

QP6/450 SM-4x $2499

Business lease: $88/Mo.
- Pentium® II Processor 450MHz/100MHz Front Side Bus
- 128MB PC100 SDRAM Memory / 512KB Secondary Cache
- *New* 16.8GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 19" Monitor w/OSD (18.1" viewable), 1600x1200, .26dp
- *New* 3Dfx 128-bit Voodoo Banshee 3D AGP Video w/16MB Based on award-Winning Voodoo2 3D Technology
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- *New* 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- *New* Altec-Lansing ADA-305 Dolby 3D Surround Sound Speakers with subwoofer
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS IntelliMouse
- MS Windows 98 w/Microsoft Plus 98
- Power Multimedia Software Bundle
- Microsoft Office '97 SBE v2.0
- 3-year limited warranty with 1-year On-Site Service**
- *Upgrade to 15.0" LCD Flat-Panel Display for $399*

QP6/400 SM-4x(with Pentium II processor).....$2299

SUPER MULTIMEDIA

QP6/450 M-4x SE $2199

Business lease: $77/Mo.
- Pentium® II Processor 450MHz/100MHz Front Side Bus
- 128MB PC100 SDRAM Memory / 512KB Secondary Cache
- 13.5GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 19" Monitor w/OSD (18.1" viewable), 1600x1200, .26dp
- Intel740™ 3D 2X AGP Graphics with 8MB SDRAM
- Internal 100MB Zip Drive with one cartridge
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- *New* 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altec-Lansing ACS-90 Speakers
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS Mouse
- MS Windows 98 w/Microsoft Plus 98
- Value Multimedia Software Bundle
- 3-year limited warranty with 1-year On-Site Service**
- *Add Altec Lansing ACS-251 Subwoofer for $39*
- *Upgrade to 15.0" LCD Flat-Panel Display for $399*

QP6/400 M-4x SE(with Pentium II processor).....$1999

QP6/450 SM-4x SE $2849

Business lease: $100/Mo.
- Pentium® II Processor 450MHz/100MHz Front Side Bus
- 128MB PC100 SDRAM Memory / 512KB Secondary Cache
- 16.8GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 21" Monitor w/OSD (20.0" viewable), 1600x1200
- *New Ultra-Fast #9* Revolution IV 128-bit 3D 2X AGP Graphics w/32MB
- Internal 100MB Zip Drive with one cartridge
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- 32X Max EIDE CD-ROM Drive
- Sound8laster AudioPCI 64V Wavetable 3D Sound
- *New* Altec-Lansing ADA-305 Dolby 3D Surround Sound Speakers & subwoofer
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS IntelliMouse
- MS Windows 98 w/Microsoft Plus 98
- Power Multimedia Software Bundle
- Microsoft Office '97 SBE v2.0
- 3-year limited warranty with 1-year On-Site Service**

QP6/400 SM-4x SE(with Pentium II processor).....$2649

M-SERIES BEST BUY

QP6/450 Best Buy $1999

Business lease: $70/Mo.
- Pentium® II Processor 450MHz/100MHz Front Side Bus
- 64MB PC100 SDRAM Memory / 512KB Secondary Cache
- 10.2GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 19" Monitor w/OSD (18.1" viewable), 1600x1200, .26dp
- Intel740™ 3D 2X AGP Graphics with 8MB SDRAM
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- *New* 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altec-Lansing ACS-45.1 Speakers w/Subwoofer
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS Mouse
- MS Windows 98 w/Microsoft Plus 98
- Value Multimedia Software Bundle
- 3-year limited warranty with 1-year On-Site Service**
- *Add Altec Lansing ACS-251 Subwoofer for $39*
- *Add a Internal Zip Drive for $ 79*

GAMING BEST BUY

QP6/450 GX-2 $2499

Business lease: $88/Mo.
- Pentium® II Processor 450MHz/100MHz Front Side Bus
- 128MB PC100 SDRAM Memory / 512KB Secondary Cache
- 13.5GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 19" Monitor w/OSD (18.1" viewable), 1600x1200, .26dp
- Intel740™ 3D 2X AGP Graphics with 8MB SDRAM
- Internal 100MB Zip Drive with one cartridge
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- *New* 3rd-Generation 4.8X DVD-ROM Drive
- Aureal "A3D" 3D Positional PCI Sound
- 3Dfx Voodoo2 based 3D Game Accelerator w/12MB
- MS SideWinder 3D Pro Joystick
- *New* Altec-Lansing ADA-305 Dolby 3D Surround Sound Speakers & subwoofer
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS Mouse
- MS Windows 98 w/Microsoft Plus 98
- Value Multimedia Software Bundle
- *Activision Game Titles:* Battlezone, Heavy Gear Interstate 76 w/Nitro Pack
- 3-year limited warranty with 1-year On-Site Service**

QP6/400 GX-2(with Pentium II processor).....$2299

intel inside pentium® II PROCESSOR

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Is Your Software Stolen?

Counterfeit software is everywhere—on the Net, in stores, even on **your new PC.** And It can **cost you big.**

BY CHRISTINA WOOD

ANNIE JONES watched as Baldwin Park, California, police officers surrounded a building containing the offices of Compact Media. Jones (not her real name) had been staking out the place since receiving an anonymous tip that it actually housed a software counterfeiting operation. The police had their guns drawn as Jones glanced at her watch: 2:30 a.m., March 6, 1998.

Suddenly, people began to leave the building, and the officers moved in. They nabbed one of the employees, Kenneth Khoung, at his sport utility vehicle. In his car they found 3400 counterfeit copies of Microsoft Office Professional. Police also apprehended Shawn Wang, the 24-year-old owner of the counterfeiting plant.

Inside the building, Jones and her partner, investigators for Microsoft, found four CD replicators (worth over a million dollars ▶

PHOTOGRAPHS BY GEOFF GRAHAM

each), two silk-screening machines for printing CD labels, three shrink-wrap devices, and more—enough to manufacture and package several hundred thousand CDs a month.

The next day while searching Wang's car, investigators found a receipt from a local storage facility. There they hit more pay dirt: an estimated $4 million worth of counterfeit Microsoft software, still on CD spindles.

All in all, six people were arrested. Three—Shawn Wang, Kai Lin Chen, and Kenneth Hoa Khoung—were charged with possession of counterfeit materials and counterfeiting equipment. Wang had not been sentenced at press time. According to Baldwin Park Detective Chris Hofford, "The max he can get is eight to ten years." Chen and Khoung will each serve a maximum of two years.

Does this incident sound more like a detective movie than a day in the life of software company employees? It might come as a surprise to learn that when you go shopping for software bargains, you may actually be contributing to the wealth of criminals like Shawn Wang—or of even worse characters.

PIRATES EVERYWHERE

COUNTERFEITING IS JUST one of many forms of software piracy. The most common is committed by people who "borrow" a friend's software and load it on their own PC, or by businesses that aren't careful to buy enough licenses for the software they use.

But more organized forms of piracy abound. Computer resellers and others often release what's known as gray market software—authentic software that's sold in violation of a distribution agreement. Small PC makers load supposedly free copies of software on the systems they sell. Scofflaws post software for illegal download on the Internet. And a few unscrupulous people seek to enrich themselves through counterfeiting.

You may not be overly concerned that software companies lose out when their products are pirated. But when you buy counterfeit or gray market software, you're getting ripped off, too. You won't be eligible for technical support, and you may be buying programs with viruses, or old, buggy versions. Buying counterfeit goods is also illegal. Though you're unlikely to be arrested, you're contributing to a criminal activity. If you're a small business, you could be liable for hefty fines—even if you thought you were buying legitimate software. So it pays to be informed.

Sandy Boulton, director of Autodesk's antitheft division, says, "We've been running an antipiracy program since 1989, and based on empirical data, it looks as if for every legal product we sell, there are seven illegal versions in the market."

The numbers for the software industry as a whole aren't quite as staggering. According to the Business Software Alliance, a coalition of software publishers, 27 percent of all software used in the United States is pirated. Worldwide, that number jumps to an astonishing 40 percent. The BSA estimates that all forms of software piracy cost the U.S. economy $1 billion in lost taxes and 130,000 lost jobs in 1996, and that the U.S. software industry lost $11.4 billion of revenue in 1997.

> "What gets me is that when you look at the **records of these counterfeiters** you don't find any tax returns. Most of these guys **don't even pay taxes.**"
>
> –Detective Jess Bembry, Asian Organized Crime Unit of the Los Angeles County Sheriff's Department

HAVE YOU BEEN BILKED?

RICHARD LANGE, a computer consultant in Wolf Point, Montana, bought a computer at an auction site for only $300. Sweetening the deal were preinstalled copies of Windows 98 and Microsoft Office 97 Professional. But when his PC arrived, there were no CDs, no manuals, and no certificates of authenticity for the software. He called the company he bought the computer from, thinking the missing CDs and certificates were an oversight. Its reps said they'd sell him the Windows discs for $45.

"That sounded real suspicious," says Lange (although missing discs are not always an indication of piracy). When Lange checked with Microsoft, the company told him it was likely that his software was pirated—and his copy was therefore not eligible for technical support or a license agreement. Not only that, but because he didn't get a CD of Windows 98, he was missing the tutorials that come with legitimate versions of the software.

You, too, may have purchased pirated software without knowing it. If you bought a no-name computer with preinstalled software but didn't get registration forms or (for Microsoft products) a certificate of authenticity, that software might be pirated. If you got a fabulous price on software at a swap meet or online auction, or from a mail-order company advertising in the back of a computer magazine, that item, too, may be illegal.

It's often hard to tell pirated software from the real thing, though. Unless you buy from a well-known source, the only way to be sure your software is legitimate is to ask its manufacturer if the place you bought it from is an authorized reseller. But pirated versions get into buyers' hands in so many ways, even the software companies sometimes can't tell the good from the bad.

THE GRAY MARKET

GRAY MARKET SOFTWARE is the real thing, produced by the software vendor but sold in violation of a distribution agreement. Often it won't come with all the retail packaging. Other than that, it can be hard to distinguish from legitimate software.

Three types of software make up most of the gray market: products from original equipment manufacturers, academic versions, and discs from Microsoft's Worldwide Fulfillment Program (formerly called the Easy Fulfillment Program).

OEM software comes bundled with PCs and other hardware as part of a marketing agreement between the software publisher and hardware manufacturers. The packaging usually states that the software is not to be sold separate from the hardware. But it often is. Either the hardware vendor decides to make a few dollars on the side and sell the OEM software by itself, or the software is stolen, ending up on the open market.

Software publishers also offer discounted academic versions of their programs to students and teachers who have legitimate identification. Some gray market resellers repackage this software, removing all evidence that it is an academic version. Others simply sell it without requiring ID.

Microsoft's Worldwide Fulfillment Program was created for corporations. If a company needs 1000 copies of Office 97, it can buy a site license at a significant discount. Instead of getting 1000 boxed programs, the company receives CDs and manuals, which are clearly marked as part of the program. But some gray marketers pose as corporations so as to buy these site licenses, then sell the software to unwitting consumers or distributors.

All three types of gray market software are widely available at online auctions, at swap meets, and even through ads in computer magazines—usually at dirt-cheap prices. According to Cynthia Navarro, senior investigator at Adobe, "Any copy you see of Adobe Photoshop for less than $400 is probably gray market."

Remember, when you buy on the gray market, you've been conned. When you go to register your program, the company may be aware that the copy you have is illegal, even if you ▶

Stolen Software: It's Everywhere You Shop

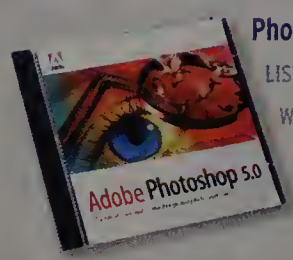
HOW EASY IS IT to buy pirated software? Shockingly easy. To find out for sure, we did a little shopping. We went to swap meets and auction sites and bought a sampling of software that sounded reasonably legitimate—except for the low price. Then we presented our stash to the software publishers to see if it was any good.

Of the five popular programs we purchased, none was what it seemed to be. Two were counterfeit and two were gray market software—sold separately from their bundled hardware. The fifth smelled suspiciously like pirated software, but the publisher couldn't be sure.

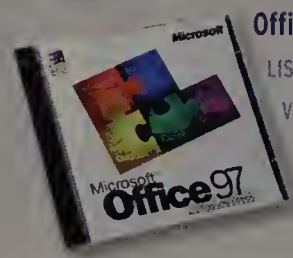
Here's a recap of our shopping spree down software's dark alleys:

Adobe Photoshop 5.0 arrived in a certified package from Spain, of all places. The package held only a jewel case containing a Photoshop CD. On the phone with an Adobe investigator, we had only to say "Spain," and she was able to describe the disc—it was from a known counterfeiter. She told us Photoshop doesn't come in a jewel case, it comes in a paper sleeve.

Microsoft Office 97 Professional came in a jewel case with no certificate of authenticity or other documentation. It was labeled Microsoft Easy Fulfillment. A Microsoft investigator quickly deemed it counterfeit because the Microsoft logo flag on the cover was the wrong color and numbers were missing along the inner edge of the CD. The vendor who sold us the disc apologized and offered a complete refund, including shipping. He denied any knowledge of the software's status.



Photoshop 5.0
LIST PRICE: $995
WE PAID: $125
STATUS: counterfeit



Office 97 Pro
LIST PRICE (UPGRADE VERSION): $349
WE PAID: $35
STATUS: counterfeit

Windows 98
LIST PRICE: $209
WE PAID: $95
STATUS: OEM edition sold on gray market

WordPerfect 8
LIST PRICE (UPGRADE VERSION): $89
WE PAID: $37
STATUS. OEM edition sold on gray market

SmartSuite 97
LIST PRICE (UPGRADE VERSION): $159
WE PAID: $15
STATUS: out-of-date version

Microsoft Windows 98 even came with a certificate of authenticity. Nonetheless a Microsoft investigator told us it was supposed to be bundled with hardware and therefore was sold illegitimately. We were told the hardware manufacturer would have to support it. Of course there is no hardware vendor, so we're out of luck.

Corel WordPerfect Suite 8 arrived in a jewel case with no documentation. It said right on the CD that it was to be sold only with hardware. A Corel investigator confirmed that fact.

Lotus SmartSuite 97: Lotus couldn't tell us much except that the software was outdated. So much for the latest features.

We can't get upgrades or technical support for any of our new software. And a detective with the Los Angeles County Sheriff's Department pointed out that he could obtain a warrant to confiscate all the counterfeit goods. Guess it wasn't such a good idea to call the police and brag about our little shopping spree.

don't. Such applications aren't eligible for upgrades or technical support—they may not even be the latest version.

FROM GRAY TO BLACK

INCREASINGLY, what you buy may be counterfeit. But counterfeiters rarely bother to copy the retail version. The box, manuals, and packaging simply add too much to their production costs. Instead, they copy OEM and Microsoft's Worldwide Fulfillment software, which come without packaging and documentation. "It saves the counterfeiter money and offers what might seem to the consumer like a reasonable excuse for the lack of documentation or certificate of authenticity," says Sarah Alexander, international corporate issues manager for Microsoft.

These counterfeiters then sell their wares to a variety of distributors who eventually sell the software to end users.

If the distributors themselves have not been fooled into thinking they're reselling legitimate software, they'll try to persuade you that their wares are on the level. They normally provide a registration number that will unlock the protection mechanism on your new CD. But when you try to register the software or obtain technical support, you'll usually be out of luck. The registration numbers are often stolen, fake, or copied during the counterfeiting process. If it was ever a legitimate number, the software publisher will know it has been compromised. If it is not a real number, the publisher will know that, too.

Craig Hammersmith, a student and network administrator in Morrison, Colorado, thought he had found a terrific deal on Microsoft Office Pro at Onsale Exchange (now Yahoo Auction), a popular person-to-person Web auction site.

Hammersmith was initially suspicious of the prices ($70 to $80) that he saw for the office suite. "I asked people I know, and they speculated that it must be overstock," he says. "One person was selling 500 copies. How could they advertise illegal software like that? I thought it must be legit."

But what he got was a CD in a jewel case, marked Microsoft Easy Fulfillment, and no documentation. When he realized the CD did not come with a certificate of authenticity, he called the vendor, who told him not to worry, Easy Fulfillment didn't come with a certificate (not true). Finally, Hammersmith called Microsoft's piracy hot line (800/ ▶

Too Good to Be True

Auction Info
1 days + 2:21:47
Current Bid: $35.00
Quantity: 100
Current Winner/s: None
# of Bids: 0
Started at: $35.00
Bid Increment: $1.00
Opened: Sep 20, 18:50

Microsoft Office 97 Pro New Sr1 Free Shipping

PLEASE CALL OR FAX US DIRECTLY! THIS AUCTION DO
CUSTOMER EMAIL ADDRESS OR PHONE #! THANKS!!

WEB PAGE ADDRESS

When we contacted the seller about the counterfeit software, the company pleaded ignorance and gave us a refund.

While shopping, we noticed the high volume and low price for Microsoft Office 97. Turns out the suite we got is counterfeit.

Check that your certificate has a watermark on the left side; it depicts Augusta Ada Byron, a nineteenth-century mathematician, programming pioneer, and daughter of poet Lord Byron.

The Real Deal

THE POPULARITY of Microsoft's programs also make them targets for counterfeiters. That's why the company bundles certificates of authenticity with all its software. But now the crooks are even copying the certificates. Here's how to tell if the certificate you have is authentic.

- When you hold the certificate up to the light, you should be able to see a continuous, metallic strip embedded in the paper.
- Hidden within the Microsoft logo are the letters "OK." Hold the certificate up to the light and tilt it until you can see the letters.
- Check that the certificate's border, text, and Microsoft logo are printed with a raised print that feels like paper money.

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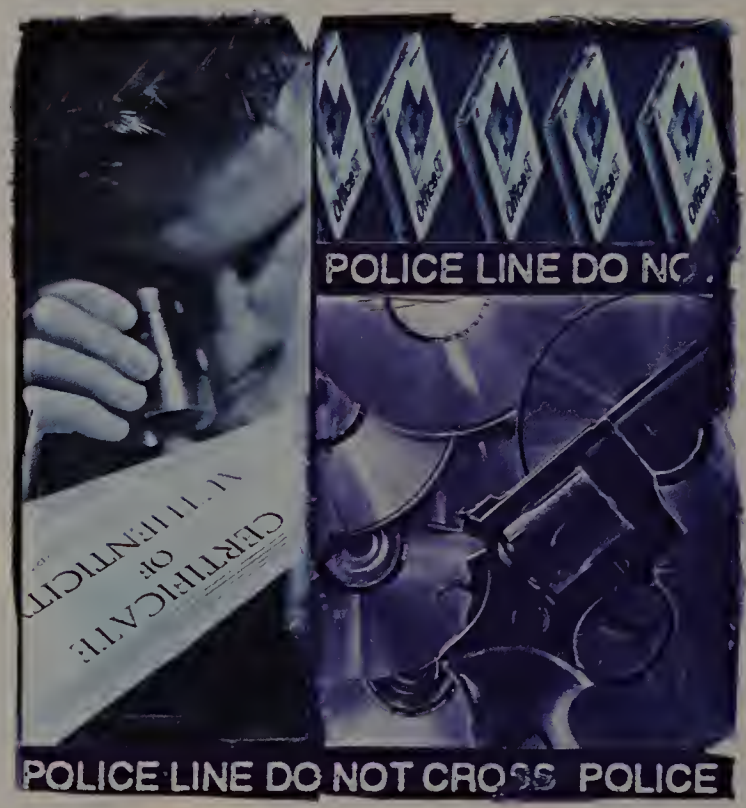
785-3448) and learned he had indeed purchased counterfeit software. In the end, Hammersmith confronted the vendor who had sold him the fake goods, and he eventually got his money back.

WHY SHOULD YOU CARE?

ON A GOOD DAY, you can get a counterfeit copy of Microsoft Office on the Web for just $35—up to 94 percent off retail. If it works and if you're certain you'll never call tech support, what's the big deal? For one thing, buying counterfeit goods is against the law. Of course, if you are caught, the worst that's likely to happen to you is confiscation of your software. But there are other reasons to avoid counterfeit items.



When you buy software from a legitimate source, you get a license to use it. The license usually entitles you to upgrade offers. But if you're a business, large or small, the license is even more important. The Business Software Alliance and the Software Publishers Association, another industry trade group, actively audit software licenses in businesses and can fine a firm up to $100,000 (through a civil court judgment) for each product it finds in violation.

Don't think you won't get caught. The BSA and the SPA both operate confidential hot lines for reporting software piracy. On average the BSA gets 100 to 150 calls per month, of which it pursues about 70 percent. In the past five years, the BSA has collected over $30 million from companies that have been found in violation of license agreements.

Even if you're never caught with counterfeit software, you could be letting yourself in for other headaches. Since the software you bought was manufactured or distributed by an unknown source, you have no assurance that it won't have viruses or be an earlier, buggier version of the program you thought you were buying. Criminals are not known for stringent quality control. According to Detective Jess Bembry, a 27-year veteran of the Los Angeles County Sheriff's Department who has arrested a number of software counterfeiters, even the crooks admit that "only about 15 to 20 percent of the software they produce is any good."

Every software firm we spoke to said it had encountered problems with counterfeit software, from viruses to shoddy workmanship. And when these companies get tech support calls from users of bad software, they have to tell callers they can't help.

But perhaps the most compelling reason to avoid (and report) counterfeit and gray market software is that the money you spend usually ends up in the pockets of frightening people.

> "If it's true that imitation is the **sincerest form of flattery,** software is an industry that is virtually **drowning in compliments.**"
>
> —Vice President Al Gore in a speech to the Software Publishing Association, September 1997

First, there are gangs. Adobe investigator Navarro says that the huge amount of money to be made in the software gray market has inspired various—often enemy—gangs to work together.

"They recruit people with no criminal background to go work for a hardware or software company—usually in shipping and receiving. [These recruits can pass] the background checks that software and hardware companies run on new employees," she explains. Once inside, the new hire scopes out the situation so the gang can commit a robbery.

After the software has been ripped off, it's often funneled to international gangs—in places such as East Asia, Russia, Nigeria, and Ireland—for distribution. Where do the profits go? Into the pockets of criminals involved in drug trafficking. "Narcotics agents are finding a lot of software and hardware when they do raids now," Navarro says.

SOFTWARE MEETS THE MOB

BUT WHEN IT comes to counterfeiting software, street gangs are small potatoes. Setting up a large-scale counterfeit operation takes lots of money. A single high-capacity CD press can cost over a million dollars. According to Bob Kruger, vice president of enforcement at the Business Software Alliance, "When you're talking about counterfeiting, you're talking about people who have organization. And *they* can be very hard-core criminals." Who are these criminals? Think Scarface, with an Asian twist.

At the Los Angeles County Sheriff's Department, much of software counterfeiting falls under the jurisdiction of the Asian Organized Crime Unit. "San Gabriel Valley [in the Los Angeles area] is the counterfeit capital for the U.S. as far as software is concerned," says Detective Bembry, a key investigator in the Asian Organized Crime Unit.

Detective Marcus Frank of the Westminster Police Department in Orange County adds, "There are high-level syndicates behind the majority of [counterfeiting], probably emanating out of Asia."

George Abbott, managing director of the International AntiCounterfeiting Coalition in Washington, D.C., agrees most counterfeit goods come from the Pacific Rim.

Software counterfeiting appeals to organized crime because it is a white-collar offense that doesn't pull long prison terms. But the money that's derived from counterfeiting funds other operations that are far more illegal. "They've used the money from counterfeiting to finance guns, drugs, gambling, prostitution...as well as legitimate businesses," says Bembry.

While much counterfeiting is carried out in this country, a large chunk takes place overseas—again, mostly in Asia. In ▶

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1997, U.S. Customs seized $54.1 million in counterfeit imports, including software, film, music, and clothing, according to Bruce Raine, senior import specialist at the U.S. Customs service in Los Angeles. Much of the merchandise ($14.5 million worth) came from China.

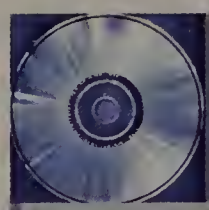
The amount of piracy in China has caught the attention of the White House. In a speech to the SPA in September 1997, Vice President Al Gore called the level of piracy in China "alarming and unacceptable." He told the group, "We went eyeball-to-eyeball with the Chinese in 1995—right to the point of sanctions—before they gave us a sweeping and comprehensive agreement to enforce intellectual property rights. Now we have to make sure that agreement is carried out."

An even broader counteroffensive may be needed. Brad Smith, Microsoft general counsel international, says he has seen a still more ominous element in the software piracy food chain. "I'm not prepared to talk about specifics," he says, "but we have seen organized criminal groups using the proceeds from software counterfeiting to pay for terrorist operations overseas. We have seen a couple of terrorist organizations get involved in software counterfeiting."

It's not the first time terrorists have been mentioned in connection with counterfeiting. Testifying before Congress in October 1995, Dempster Leech, a detective who has investigated counterfeiters, implicated terrorists. According to a summary of the hearings, Leech discussed counterfeiting in general. The summary reads, in part: "Money generated from counterfeiting supports organized crime, [Leech] said, adding that recently, several high-level players indicted in a counterfeiting organization were financially tied to terrorist groups such as the one that bombed the World Trade Center."

WILL THEY GET AWAY WITH IT?

FUNDING HARDENED criminals is a far more terrifying consequence of using pirated software than, say, being ineligible for technical support. But ironically, it's the latter that will eventually lead to a crackdown on counterfeit and gray market crooks. While local law enforcement, customs officials, and the FBI are all taking software counterfeiting more seriously than in the past, they still look to software companies to alert them to counterfeiters. The firms get much of their information from users who call them after unknowingly buying pirated software.



Don't Get Burned

EVERYONE WANTS a bargain, but to shop for the best price on software without getting fleeced, follow these guidelines.

Ask yourself, Is the price too good? Software selling for far less than the suggested retail price should raise a red flag. Bargain prices often mean something illegitimate.

Consider the source. If you're shopping at a suspect source—classified ads, swap meets, person-to-person auctions—be suspicious. Pirated software abounds.

Look for a registration card or certificate of authenticity. Microsoft software should have a certificate of authenticity. Other software should come with a registration card. But since these documents can be counterfeited, keep in mind the source and the price.

Ask before you buy. If you aren't sure about a source, first call the software maker or check its Web site for a list of authorized resellers.

Blow the whistle. If you've purchased software that turns out to be hot, call the company you bought it from and demand a refund. Most resellers would rather refund your money than get busted.

To report bogus software, call the software maker. If you bought it at an online auction, report the offending seller to the site. At EBay, go to pages.ebay.com/aw/invest5.html. At Yahoo Auctions, go to www.yahoo.com/info/support/contacts.

Tips from consumers are just the beginning. Software makers are working on technological solutions to allow copying only when it's legal. They're also working with the BSA, the SPA, and legislators to rewrite laws to make it easier to prosecute counterfeiters and impose harsher sentences.

Microsoft's Brad Smith isn't sure changing the law is enough. "What really worries me is not that the law is weak but that the profits that organized crime derives from counterfeiting are so great that fines and penalties are not a sufficient deterrent," he explains. "There are people who are prepared to spend three years in prison if there is $4 million waiting for them when they get out. We need a way to separate organized criminal operators from their money."

SPOTTING THE CONS

WHAT ABOUT cracking down on those who sell pirated software to end users? Investigators agree no one has the resources to arrest and convict the many distributors you encounter while bargain hunting. Even with such resources, proving a distributor is intentionally selling pirated software can be difficult.

Software companies are working with Internet auction sites to stop sales of gray market and counterfeit software. According to Brad Handler, corporate counsel at EBay, a major online auction site, "We have a zero tolerance for piracy and fraud. We go to whatever lengths it takes to protect the licensee." Both EBay and Yahoo Auctions told *PC World* they will pull any auction they discover is selling bogus goods. But sites rely on software firms and shoppers to identify those sales. So while software makers and law enforcement work to stop thieves from flooding the market with bogus goods, consumers must learn to recognize a con when they see one.

Kevin McNeil, vice president of OEM sales for Corel, advises, "If these auction sites [and other outlets] aren't successful, they'll stop. If customers think before they buy—call the software company's piracy hot line and see if it's legit—they can save themselves a lot of trouble and prevent this kind of crime."

Even if you think Bill Gates has enough money and doesn't need more of yours, heed a warning from Detective Bembry about buying pirated software: "You aren't just hurting Microsoft. I know people don't worry if Microsoft is out a few dollars. But I hope you don't want to support organized crime."

Christina Wood is a contributing editor for PC World. ■

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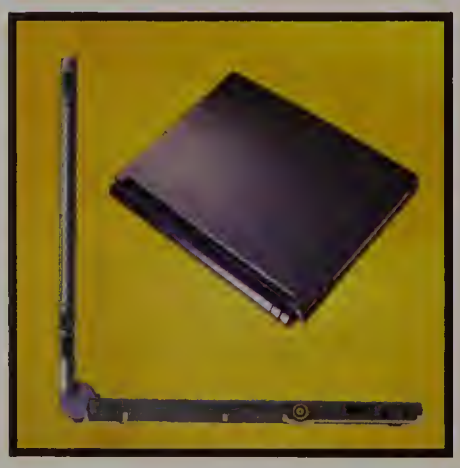

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SNY 251

Small Office
Home Office

THE BEST **OFFICE** FOR YOUR **BUDGET**

Whether you're a solo start-up or a growing business, you are only as good as your gear. Here are the right PCs, printers, fax machines, phones, and more.

BY PETER SCISCO

ILLUSTRATIONS BY ADAM McCAULEY

PHOTOGRAPHS BY MICHAEL VENERA

BEHIND ME THE NETWORK is humming, the fax machine is singing, and light conversation peppers the phones. I'm feeling smart and successful, and I don't care who knows it. My office setup is everything a SOHO entrepreneur could want. It ought to be. It cost me $10,000.

Of course, I didn't spend all that money at once. Like most entrepreneurs, I began my software training business with little more than a dream and a new credit card. But as I added associates and equipment, I learned quickly that growing a small business meant balancing my wallet against my wish list. Whether you have a one-person home-office start-up, an expanding small business, or a burgeoning SOHO franchise, the formula is the same—get the right gear at the right price.

WHAT EVERY OFFICE NEEDS

REGARDLESS OF its budget, annual sales, or staff size, every small business needs a baseline of office equipment. The basic setup will run you from $2000 to $2500 per employee. Fortunately, as your business grows, you'll be able to save a little money by sharing devices like printers and fax machines. Here are the essentials:

- **PC.** The computer acts as your storefront, front desk, and back office all in one. And though any PC you buy today will be cheaper in six months, as a SOHO entrepreneur you have to bite the bullet and buy as much PC power as your budget can absorb without sacrificing other essential equipment needs. Plan on spending a minimum of $1500 for a 350-MHz CPU outfitted with 64MB of memory, a 5GB hard drive, a 17-inch monitor, a V.90 modem, and an office software suite.
- **Printer.** The PC and printer form the backbone of a well-appointed office. Color printing for creative agencies or for client presentations requires a top-tier ink jet printer for around $300. If your business needs volume printing more than it needs color, you can find a suitable small-office laser printer for about $350.
- **Phone and fax.** The coin of the SOHO realm is communications, so a good phone system, an on-call fax machine, and a voice-mail service are all essentials of any office setup. Two-line full-featured phones with speed dial, Caller ID readouts, and hands-free speakers cost as little as $100; cordless models go for about $200.

Fax machines come in two basic types: thermal and plain paper. Thermal models are cheaper (around $120), but their appeal quickly fades when you consider the high cost and inconvenience of thermal paper (which curls and yellows with age) and the falling prices (as low as $200) of plain-paper fax machines.

You can't always be near the phone, so to keep in touch with customers you need an answering machine or voice-mail service. A digital recorder with multiple mailboxes and 15 minutes of recording time is cheap (around $75), but you're better off using the central answering services provided by your local telephone company. Though more expensive in the long term (a recurring fee of $10 to $25 per month) they're more flexible and reliable than an answering machine—and project a more professional image to callers.

- **Uninterruptible power supply.** Just one hiccup in the grid can vaporize a morning's worth of work. That's why you should enlist the protection of an uninterruptible power supply—and doing so costs as little as $90 per workstation.
- **Chair.** PC hardware may hog the spotlight, but no small office can function without a solid supporting cast. Even the most ardent fitness freak won't last long slaving away at the family table in a ladder-back kitchen chair. Earmark at least $150 of your budget for a chair that meets these basic ergonomic criteria: a stable five-wheel base, backrest and lumbar support adjustment, seat height adjustment, good padding, seat tilt adjustment, seat depth adjustment, back angle adjustment, and adjustable padded armrests.
- **Desk.** The work you do determines the type of desk you need. Many conventional desks are more appropriate for writing and paper shuffling than PC work: Their surface is too high for a keyboard ▶

TIPS TO KEEP YOUR BUDGET ON TRACK

Cut your taxes. Buying equipment can actually save you money. That's because Section 179 of the Internal Revenue Code lets taxpayers deduct the cost of many equipment purchases. As a rule of thumb, equipment intended for long-term use (more than a year) qualifies for Section 179 and can be deducted as an expense (up to a limit of $10,000) in the year that it is purchased. Consult a tax adviser on the best way to take advantage of this deduction.

Maximize your dollars. Don't jump on the first discounted item you find. Even if you're located near a discount office-supply store like Staples, Office Depot, or OfficeMax, shopping online can save you money and time, especially on bulk orders. For example, Quill (www.quillcorp.com) steeply discounts paper, printer ink refills, and other general office supplies. Purchase these items in quantity, and discounts approach rock bottom. If you open a business account with a merchant, you may be eligible for further discounts.

Don't be a budget slave. While it's important to stick close to your preset budget, consider your productivity needs first. If your business relies heavily on graphics or number crunching, by all means spend a little more for a fast PC with a high-end video card and at least 64MB of memory. If you're deskbound for most of the day, or plan to entertain clients in your office, invest in a swankier desk and a more comfortable chair. Hey, it's your money, right?

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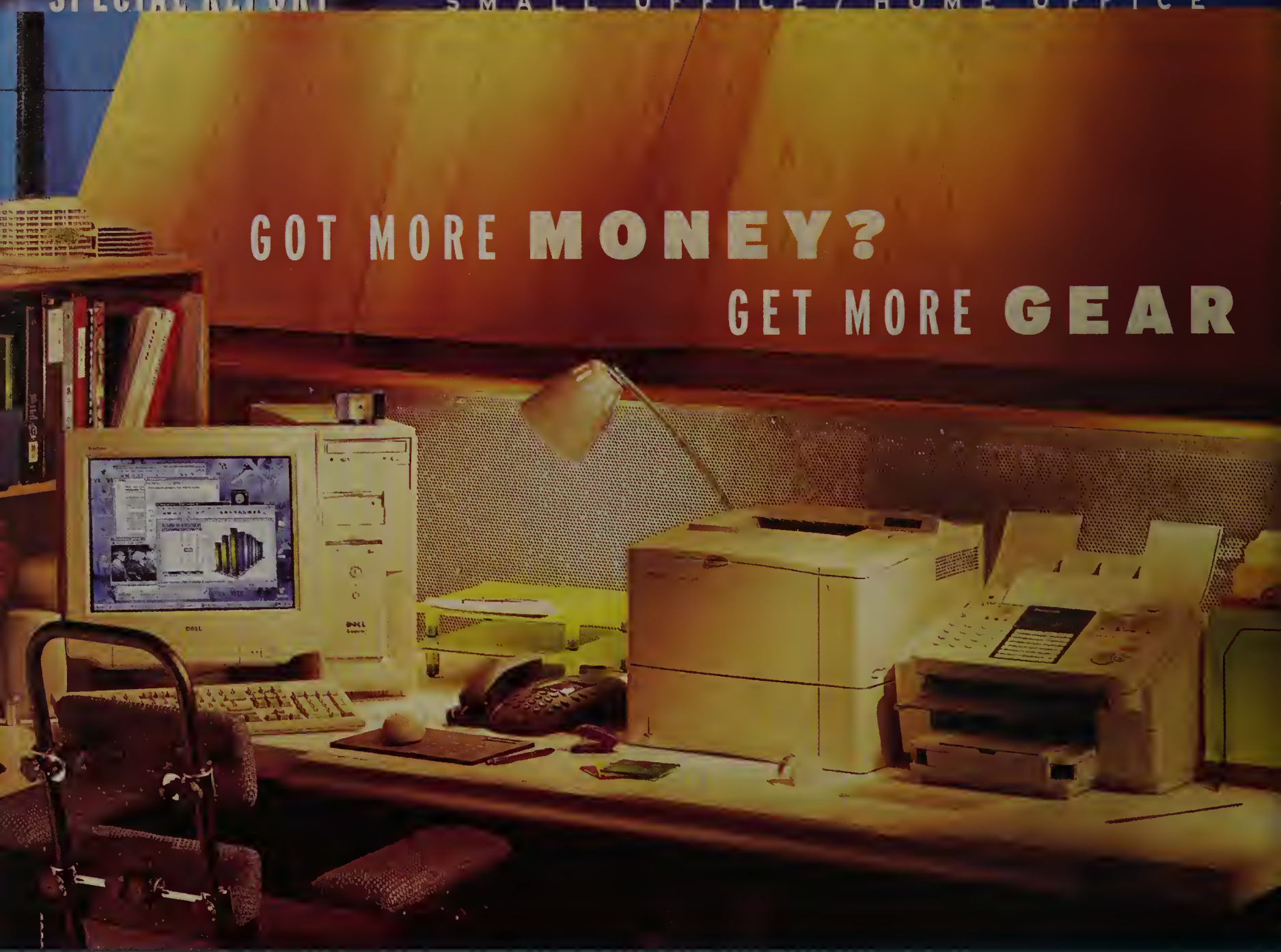

SPACE DESIGNED BY STUDIOS ARCHITECTURE

YOU HAVE A BUDGET. Every business does. But don't let the bottom line drag you down. If you have the extra cash, allow yourself to set up shop with a more generous spirit.

Start by putting a rocket on your desktop—one of **Dell's XPS R series** of barn-burners, say. For $3149, you can get a top-of-the-line XPS R450, with a Pentium II-450 CPU, 128MB of RAM, a 16.8GB hard disk, a 21-inch monitor, and enough multimedia accessories (including a third-generation DVD-ROM drive and Dolby Surround Sound) to run a home theater or home business. (Dell; 800/388-8542; www.dell.com)

You expect your new business to expand, so get a workgroup printer that can keep up with you as you grow. For companies that produce most of their documents in black and white, the **HP LaserJet 4000 TN**, a *PC World* Best Buy in November, can handle the load. The $1599 price tag buys you speed (rated at 17 pages per minute), excellent print quality (1200 dots per inch), a generous 600-page sheet feeder, and network-ready connectivity. (Hewlett-Packard; 800/752-0900; www.hp.com)

To handle the rest of your document chores—faxing, color scanning, color printing, and photo copying—**Panasonic's Panafax UF-342** ($1395) does it all. The printer and scanner resolutions make some concessions to affordability, but the photocopier enlarges and reduces (from 70 to 141 percent), and the fax component has a 30-page document feeder and memory. (Panasonic; 800/742-8086; www.panasonic.com/office)

For sitting, break the rules but not your back with the **Zackback Computer Posture Chair**. With individual posture adjustments and adjustable armrests built around a 60-pound tubular steel frame, the chair has won praise from desk jockeys and ergonomic consultants alike. Zackback claims its custom design enforces the correct use of abdominal muscles and helps workers breathe easier and endure less skeletal stress. And (are you sitting down?) the chair sells direct for $899. (Zackback; 800/748-8464; www.zackback.com)

or too low for a monitor. Look for desks designed for a range of tasks—ones with an adjustable keyboard shelf and a higher writing surface. Though you can buy a do-it-yourself, assembly-required computer desk for $60 or so at a mass merchandiser, plan on spending about $500 for a more solid, customizable workstation from a furniture or office-supply store.

Here's the lowdown on the gear I purchased to set up a one-person office, to accommodate a second associate, and to expand into a four-person workspace. I figured out what equipment I needed to get my jobs done and then identified the options I had within my budget. My goal was to build a durable small-business life-support system—one that balanced performance and budget and freed me from managing technology so I could focus on managing my business. You should ask nothing less of your own office. (For more information about products mentioned in this article, see page 198.) ▶

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MODEL	9 VX	VIENNA PRO 75	7VX
CRT	19" HI-CONTRAST	17" DIAMONDTRON	17" HI-CONTRAST
DOT PITCH (MM)	0.22 Horizontal	0.25 A G	0.26
VIEWABLE AREA	18.0"	16.1"	16.0"
H-SCAN (KHZ)	24-96	24-96	30-96
MAX. RESOLUTION	1600x1200	1600X1200	1600X1200
OPTIMUM RESOLUTION	1280X1024 @85 Hz	1024X768 @ 85 Hz	1024X768 @ 85 Hz

MODEL	7VXL	7V	5V
CRT	17" MICROFILTER	17" S-MASK	15" S-MASK
DOT PITCH (MM)	0.26	0 27	0 28
VIEWABLE AREA	16.0"	16.0"	13.8"
H-SCAN (KHZ)	30-70	30-70	30-70
MAX. RESOLUTION	1280X1024	1280X1024	1280X1024
OPTIMUM RESOLUTION	1024X768 @ 75Hz	1024X768 @75 Hz	1024X768 @ 75 Hz

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TAKING CARE OF BUSINESS: THE SOLO SOHO

TRYING TO OUTFIT a one-person office on a shoestring? You can get everything you need for as little as $2360, though for a few C-notes more you can work in style.

THE EMPOWERING PC

SIZZLING, 450-MHZ Pentium II computers come with luxuries like subwoofer-enhanced speaker systems and a DVD-ROM drive—great stuff, but not essential in a SOHO. What a small office needs is simple: a machine that will help pitch projects and close clients. Think "long-term investment," not "Lara Croft."

Quantex, which has moved steadily up *PC World*'s Top 20 charts in recent years, makes the investment pay off with its QP6/350 M-3x. This $1599 PC features a Pentium II-350 processor with 64MB of RAM and a flexible voice/fax/data modem with a built-in speakerphone. You probably won't need the phone options, but a modem is essential these days—your business will need e-mail and Web browsing capabilities at some point. Add the Corel Office Suite 8 bundle, and you have all the PC tools a small business needs.

Another worthy choice is the GP6 350c from Gateway. Even after you tweak the basic 64MB model by adding audio, speakers, and a 56-kbps modem, as well as swapping up from a 15-inch monitor to a 17-incher, this PII-333 PC costs $1699—just $100 more than the Quantex. Also, the Microsoft Office 97 Small Business Edition with Bookshelf, the suite that comes with the system, is worth a few hundred dollars and will keep a small business running smoothly for some time.

AN ALL-BUSINESS PRINTER

SOME EVENINGS, I like to see a good film noir, and then sit in a dimly lit bistro conversing intensely over very black coffee in a heavy white cup. But back in the office, I want color—splashy graphics, eye-catching coupons, and lively presentations. Nonetheless, I don't want to give up the professional look of crisp black text.

A single-person office can churn out a basketful of letters and documents with help from a good new color ink jet printer. These machines deliver sharper, more readable text than their predecessors, with output rivaling that of some laser printers.

My biggest gripe against color ink jets is speed—they don't have any. But the versatile Canon BJC-5000 uses a clever double-printhead design that accepts two black ink cartridges side by side, enabling it to print text as fast as—if not faster than—many personal laser printers. Canon claims a print speed of 7.5 pages per minute monochrome and half that for color, though PC World Test Center tests rated the BJC-5000's actual speeds at 13 to 31 percent of Canon's ratings (see "All Color, All the Time," page 160). If you run a color cartridge alongside a photo cartridge on the $249 BJC-5000, you get eye-opening prints by mixing seven colors.

Like the Canon BJC-5000, the $249 Lexmark 5700 Color Jetprinter tries to break through the traditional speed bottlenecks that are encountered by color ink jets. Printing black text at 1200 dots per inch, the 5700 creates plain monochrome text documents at a rate of 8 ppm (according to Lexmark) and color pages at 4 ppm. Our Test Center found that the printer produced color pages at a less brisk pace, but the Lexmark still ranks among the best in its class.

LEXMARK'S 5700 Color Jetprinter gives you hues you can use at the speed you need. And at $249, it won't bust your budget.

In some businesses, such as transcription services and legal offices, speed and large document capacity are far more important than ability to print in color. Small-office laser printers, like the Brother HL-1040, can handle this workload without breaking the bank. The HL-1040 prints at a speed of 10 ppm, according to our Test Center, in easy-to-read 600-dpi resolution. It uses a straight paper path to keep SOHO owners out of a jam and is competitively priced at about $300.

The Minolta PageWorks 8L costs about $80 more than the HL-1040, but its sharp text output and page production rate of 8 ppm (in tests conducted by the PC World Test Center) make the extra cost easier to tolerate, especially if your business churns out reams of paper every day.

THE FACTS ON FAX

FAXING FROM the PC has obvious benefits. Instead of leaving your desk to feed the fax, you just send the document to your modem as if you were directing it to your printer. And you'll find that scheduling faxes to transmit during off-peak hours is a snap with fax software.

Those conveniences don't obviate the need for a stand-alone fax machine, however. In particular, PC faxing is useless for sending documents with signatures. Fortunately, a plain-paper fax machine ▶

THE SOLO SOHO

RECOMMENDED EQUIPMENT	RANGE OF PRICES
PC (Pentium II-350, 64MB RAM, 17-inch monitor, 56-kbps modem)	$1500-$1700
Color/monochrome printer	$230-$400
UPS unit	$90-$110
Chair	$150-$375
Desk	$60-$500
Fax	$230-$250
Phone	$100-$200
TOTAL	$2360-$3535

This chart represents what you can expect to spend for a one-person small or home office.

TO SEE WHAT IT CAN REALLY DO, TURN IT OFF. The IBM PC 300PL. With Alert on LAN technology, it can remotely signal problems like tampering or system removal before they become crises – even when it's turned off. It's all about giving you better control over your network and better control over your e-business. This is important. See the affordable IBM PC 300PL at **www.ibm.com/ibmpc** or call 1 800 IBM 7255, ext. 4759.

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can be as affordable as it is essential. If open space in your office is at a premium, the small footprint of Brother's IntelliFAX 770 will make a nice fit, and the $229 price won't crowd your budget. The unit's 48-number autodial memory helps you keep up with current clients; the 20-page memory means faxes still come in even if the paper tray is empty; and the machine can double as a simple photocopier.

POWER BROKER: APC's Back-UPS Office keeps your business running (for 5 minutes) when the lights go out.

Canon's $250 Faxphone B640 is also a good choice: The automatic telephone/fax switch lets the B640 share a phone line, minimizing some long-term costs. The Faxphone's 20-page document feeder is twice as big as the IntelliFAX 770's, but its 15-page memory is 25 percent smaller.

If your office space is small, and your fax, printer, and copier output is modest, consider a multipurpose device that combines faxing, printing, and copying. By having all of these capabilities in a single unit, you can save about $150 and a passel of desk space. Brother's MFC-4650, for example, sells for under $600 and delivers 600-dpi laser printing, copying with enlargement and reduction, and scanning and faxing (with an optional Internet fax account). On the other hand, if you rely heavily on photocopies or faxes in your work, you'll do better with separate machines, because they're faster and easier to maintain. And if the copier breaks down, you'll still be able to use the other two workhorses.

THE PHONE

THE PHONE IS YOUR business's umbilical cord—a vital connection to clients and the marketplace. That's why it's wise to invest in a telephone that lets you take command of your communications now and is versatile enough to handle extra phone lines as your business grows. The Panasonic KX-T3185D three-line speakerphone offers three-way conference calling, speed dialing, and an LCD display for $170. Uniden's $200 EX965 is a 900-MHz two-line cordless speakerphone with speed dialing and an LCD display. The $160 Lucent Technologies AT&T 954 four-line intercom speakerphone (from Philips Consumer Communications) offers speed dialing and three-way conferencing, and you can expand it into an eight-line, 12-station system.

DATA SAVERS: UPS BACKUP

A SEVERE thunderstorm—or even a routine brownout—can drive a spike through the heart of your electronic components, destroying hours or days of work. The only way you can guarantee nonstop office operation is by investing in an uninterruptible power supply that includes built-in surge protection. These units work by supplying battery power during emergencies so that you can save your work and then shut down your equipment properly.

American Power Conversion's Back-UPS Office protects small and home offices at six power outlets (three with battery backup and three with surge/spike protection only) plus phone and network outlets. It provides about 5 minutes' worth of emergency shutdown power—enough time to let you save documents and close down your system—and it sells for around $99.

Tripp Lite's Internet Office 280 UPS offers similar protection and the same number of outlets for about $10 more. Both the APC and Tripp Lite units come with a hefty $25,000 guarantee against equipment damage. If their UPS units fail to prevent a power surge from frying your system, they will pay for repair or replacement.

THE BOTTOM LINE: COMFORT

SELECTING AN APPROPRIATE office chair is the most individual choice you'll make when outfitting your SOHO. There are no shortcuts to making the right decision, and standard specifications mean little. To find the right chair for the job, you have to visit the best office and furniture stores in your area, roll out every chair, sit in it, and ask yourself, "Is this the piece of furniture that I want to perch on for 8-plus hours every day?"

One important detail to look for: a sticker or tag indicating that the chair meets the ergonomic design guidelines established by the American National Standards Institute or by the Human Factors and Ergonomics Society. Most folks will be able to ease into a comfortable seat for as little as $125.

The IFS/Vogel Peterson Intense Action Chair, for example, sells for around $150 and delivers all the ergonomic necessities, including adjustable armrests. Be sure to try it out, though; some larger people find the chair a tad wobbly.

Global offers a somewhat more expensive alternative for $375. Its Gusto II task chair provides comfort; increases stability; and includes adjustable lumbar support, a thick 3.5-inch padded seat, and adjustable arms. ▶

THE TWO-PLAYER OFFICE

RECOMMENDED EQUIPMENT	RANGE OF PRICES
2 PCs (Pentium II-350, 64MB RAM, 17-inch monitor, 56-kbps modem)	$3000-$3400
Color/monochrome printer	$230-$400
2 UPS units	$180-$220
Network	$90-$400
Scanner	$125-$150
2 Chairs	$300-$750
2 Desks	$120-$1000
Fax	$230-$250
2 Phones	$200-$400
TOTAL	$4475-$6970

This chart represents what you can expect to spend for a two-person small or home office.

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MOVING ON UP: THE SOHO BUILT FOR TWO

WHEN YOUR small company acquires an associate, the number of your clients and the resulting workload can more than double. Luckily, your costs don't have to, because you can share devices—especially if you install a network. Linking PCs in a small network lets you and your partner share hardware resources (like printers) and data files (like client contact lists).

In outfitting an office for two, $5000 is a good target budget. Subtract the cost of your new colleague's PC, chair, phone, and UPS, and you'll have $230 to $1320 left to spend on a network, a scanner or faster printer, or more powerful computer.

NET(WORK) GAINS

WINDOWS 95 AND 98 have built-in support for networking, so you can create a LAN with a couple of ethernet cards and some coaxial cable. You may be able to order your PCs with a network card already installed, and save a little money.

For an all-in-one solution, try the Linksys Network Starter Kit. For $90, you get two cards, cables, and a five-port hub for easy hookup and expansion. Linksys also provides free tech support, even on Saturdays. The two 15-foot cables are the skimpiest features of this kit. You'll need to buy additional cable if your desks are far apart.

If you don't like to install cards, try using the Anchor Chips EZ-Link Instant Network to build a LAN. This setup costs about the same as the Linksys gear; it connects computers through the computer's Plug and Play USB ports (available as standard gear on new computers or as an add-on port for older models). Linking two computers costs about $90.

Lease restrictions may prevent you from running cable through walls to link your PCs. There's no cheap fix in such situations, but Proxim's Symphony offers a good alternative. A card installed in each PC transmits data over a radio frequency to distances of up to 150 feet. This frequency uses the recently established 2.4-GHz band, set aside by the FCC for personal radio transmissions. According to Proxim, the frequency eliminates potential interference from cordless telephones and provides enough power to reach through walls to the other PC. You can expect to spend about $300 to link two desktop computers with Symphony.

Though a wireless network looks more attractive, cables and ethernet cards are cheaper and more reliable. If leases or cosmetic concerns prohibit you from drilling through walls, and each PC is in a separate room, run the cable along the baseboards and cover it with tape that matches the wall color.

CHEAP SCANS

YOU MAY BE tempted to add a copier when expanding to a two-person office. But think again: In many cases, making occasional runs to the nearest Kinko's is less of a hassle than enduring the limited functions of a cut-rate copier. For example, most inexpensive copy machines can't reduce or enlarge images, or handle big quantities of copies.

A color flatbed scanner can be a better choice for small offices. For less than $150, you can buy a scanner that also functions adequately as a copier—provided you aren't in a hurry (personal copiers make copies in seconds, while a scanner takes a minute or more). If time constraints aren't critical, a scanner can give a small office some interesting options, such as the ability to make brochures featuring photos of your company's product.

NEED COPIES? Plustek's OpticPro 9636 scanner doubles as an inexpensive copier.

For $149, Plustek's OpticPro 9636 scans images in millions of colors, easily attaches to your computer's parallel port, and can scan negatives and slides (a feature that can cost several hundred dollars on other machines).

Another good choice, the $129 Umax Astra 1200P, comes with an excellent suite of software for creating an instant copy shop. Like the OpticPro, it connects to the PC's parallel port and scans in millions of colors. Unfortunately, the Astra can't scan slides and negatives.

WORKGROUP WONDER: THE FOUR-PERSON SOHO

A SOHO THAT GROWS from a solo venture into a four-person business has to rate as a success. To stay on top, equip your staff with high-quality, workhorse hardware. As your equipment budget nears $10,000, you can move away from personal technology toward more powerful multiuser systems. Instead of overtaxing a personal laser printer, for example, consider buying a workgroup printer that can handle the entire office load. ▶

THE FOUR-PERSON ENTERPRISE

RECOMMENDED EQUIPMENT	RANGE OF PRICES
4 PCs (Pentium II-350, 64MB RAM, 17-inch monitor, 56-kbps modem)	$6000-$6800
Color/monochrome workgroup printer	$650-$800
4 UPS units	$360-$440
Network	$360-$500
Photocopier	$600-$1000
4 Chairs	$600-$1500
4 Desks	$240-$2000
Fax	$230-$250
Phone system	$500
TOTAL	$9540-$13,790

This chart represents what you can expect to spend for a four-person small or home office.

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ONE SIZE PRINTS ALL

BUYING A ROBUST workgroup printer makes sense if four people have to share it. The Xerox DocuPrint P12 cranks out pages at 600-by-600-dpi resolution, has a 330-sheet input tray, and can output 250 pages. It offers outstanding text quality and comes with a three-year warranty. Best of all, it costs only $699 (most workgroup devices cost $1000 or more) and prints more than 9 pages per minute.

If you need a color printer, check out the Epson Stylus Color 1520. It requires high-quality paper for the best results, and its text speed is slow, but its street price can go as low as $799. If you've got the cash, this Epson's multiuser capabilities and brilliant color printing make it an obvious choice as your SOHO's second printer.

SPREADING THE NET

A SIMPLE network hub like the Linksys Network Starter Kit can be extended to link an entire office of five, but if you use the Internet much, you're better off with Ramp Networks' WebRamp 300e. The 300e can support three (mixed-speed) external modems for faster Web browsing. The company's ISP-independent link technology downloads Web files in sections along different connections. The 300e attaches to a network hub or acts as a hub itself, with four Ethernet ports for SOHO networks. Pricing starts at $499.

YOUR CALL IS IMPORTANT

A GROWING SOHO needs more sophisticated telephone service. Centrepoint Technologies' Concero Switchboard lets you divide two analog telephone lines among six extensions and automatically route calls to employees, fax machines, answering machines (including centralized services), or a master PC. At under $500, this small-office PBX costs less in the long run than a fancy proprietary phone system. And it's more elegant than muffling the receiver and shouting "Hey, Mary, it's for you!" as an important client waits at the other end.

ALL COPIES GREAT AND SMALL: HP's Color Copier 150 produces even poster-size pages.

COPY THAT

A FOUR-PERSON SOHO may find having an on-the-premises photocopier is cheaper than relying on an off-site print shop. Still, photocopiers that can enlarge, reduce, and make multiple copies quickly are expensive. A unit that meets moderate photocopying needs costs $600 to $1000.

The $599 Canon PC-745 reduces or enlarges in 1 percent increments across a range from 70 to 141 percent of the original size and produces up to 100 copies per session. Design-intensive small businesses can make their own color copies by spending $600 on the HP Color Copier 150. This machine handles reductions and enlargements (of up to 400 percent); includes a "poster mode" for making large displays; and even copies in reverse-image "mirror mode" to produce special thermal transfers for company T-shirts.

If you have a bigger budget, you may be tempted to splurge on a few nonessentials. Don't. A video card with a TV tuner adds nothing to a business but the distraction of *Judge Judy*. A small business doesn't need to watch Kevin Costner flop in *The Postman* on DVD or listen to high-decibel warriors blasting cyberdogs from the planet Kirilian in surround sound. Remember: Any equipment that comes in the door must have a defined role, because it also takes money out the door.

[Editor's note: All prices quoted are at the time of issue close on October 9, 1998.]

Peter Scisco is a freelance writer and office technology consultant based in Winston-Salem, North Carolina. ■

VENDOR INFO

American Power Conversion; 800/877-4080; www.apcc.com
INFONET NO. 727

Anchor Chips; 619/613-7900; www.ezlinkusb.com
INFONET NO. 728

Brother International; 800/284-4329; www.brother.com
INFONET NO. 729

Canon USA; 800/652-2666; www.usa.canon.com
INFONET NO. 730

Centrepoint Technologies; 888/332-9322; www.ctrpoint.com
INFONET NO. 731

Epson America; 800/463-7766; www.epson.com

Gateway; 800/846-4208; www.gateway.com
INFONET NO. 732

Global; 800/220-1900; www.globaltotaloffice.com
INFONET NO. 733

Hewlett-Packard; 800/752-0900; www.hp.com
INFONET NO. 734

IFS/Vogel Peterson; 800/942-4332; www.vogelpeterson.com
INFONET NO. 735

Lexmark International; 800/539-6275; www.lexmark.com
INFONET NO. 736

Linksys; 800/546-5797; www.linksys.com
INFONET NO. 737

Minolta; 888/264-6658; www.minoltaprinters.com
INFONET NO. 738

Panasonic Office Products; 800/742-8086; www.panasonic.com/office
INFONET NO. 739

Philips Consumer Communications; 800/222-3111; www.philipsconsumer.com
INFONET NO. 740

Plustek; 800/676-1119; www.plustek.com
INFONET NO. 741

Proxim; 800/229-1630; www.proxim.com
INFONET NO. 742

Quantex Microsystems; 800/896-4898; www.quantex.com
INFONET NO. 743

Ramp Networks; 888/726-7638; www.rampnet.com
INFONET NO. 744

Tripp Lite; 773/869-1797; www.tripplite.com
INFONET NO. 745

Umax Technologies; 800/562-0311; www.umax.com
INFONET NO. 746

Uniden America; 817/858-3316; www.uniden.com
INFONET NO. 747

Xerox; 800/832-6979; www.xerox.com
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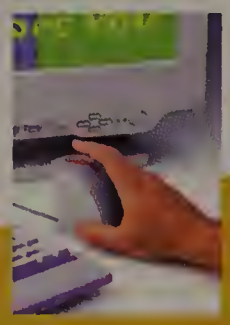

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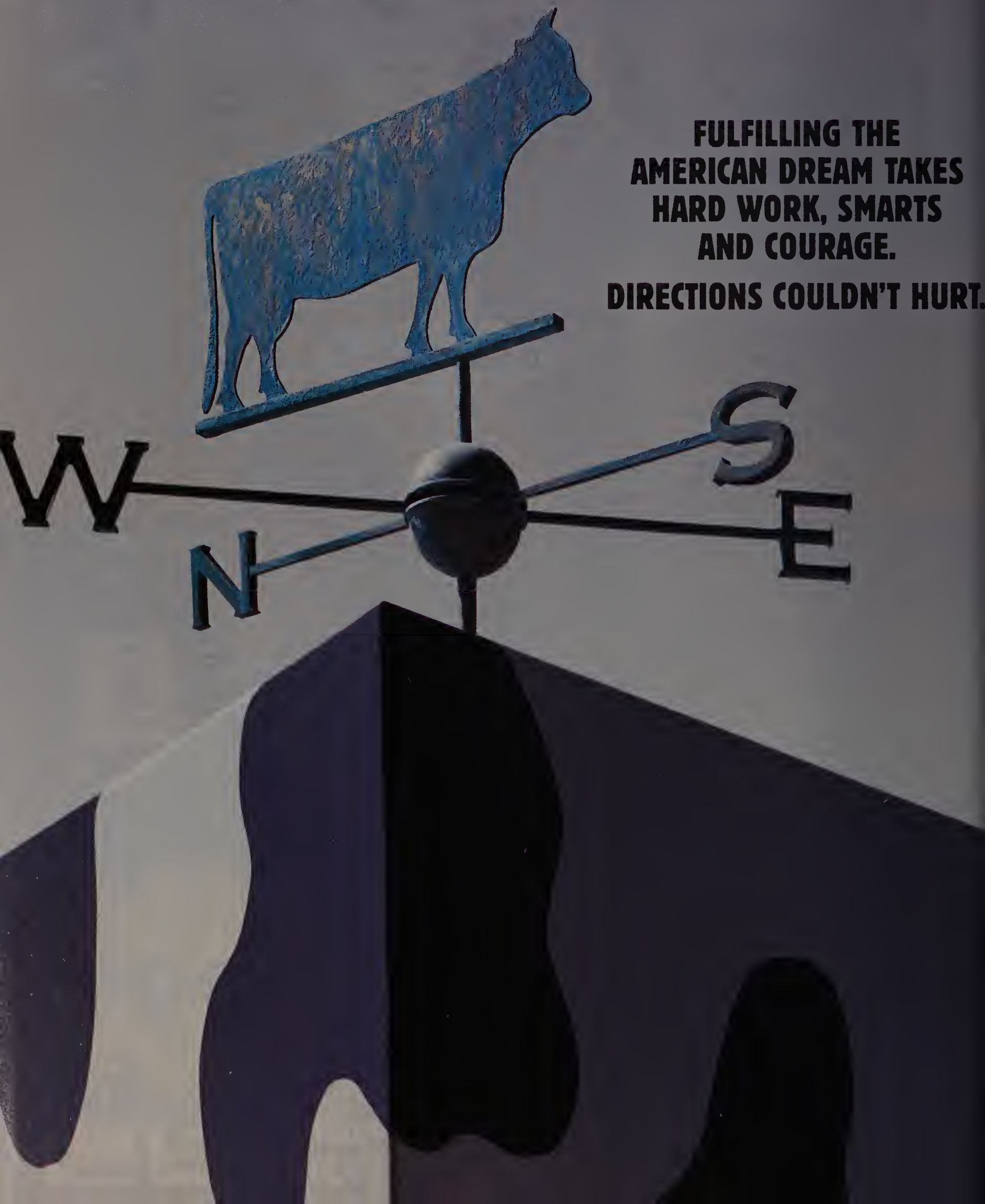
PCWEEK BEST OF COMDEX

EDITOR'S CHOICE



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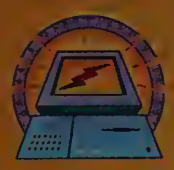
A monthly update of the best desktop PCs, notebooks, printers, monitors, graphics boards, and modems

PC WORLD

TOP 100

Big-Business PCs, Small-Office Prices

206 Power Desktops

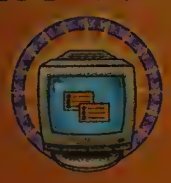


216 Budget Desktops

226 Notebooks

233 Printers

235 Monitors



239 Graphics Boards

241 Modems

Edited by Andrew Brandt and Michelle Campanale

BUDGET STEAMROLLER: Micro Express's new MicroFlex-35A, with its low-cost AMD processor, shot straight to the top of our budget PC chart.

POWERFUL PENTIUM II-400 and Pentium II-450 systems continue to break records. Led by the exceptional Micron Millennia 400 Max, systems on the Power Desktops chart achieve slimmer price tags than ever before. But to hold on to their positions, smartly dressed SOHO systems like the Millennia must withstand challenges from a new class of competitor: the inexpensive corporate PC.

A year ago, you would have shelled out $3000 or more for a corporate-minded modular system like Dell's OptiPlex Gxa266 or Gateway's E-3100 PII-266. Developing an easily maintained, reliable, and compatible corporate PC requires a lot in the way of design and engineering, so the prices of those systems tended to be considerably higher than the prices of typical machines housed in a standard case. In addition, many corporate systems use the latest processor available. Although this strategy can increase the useful life span of a computer, it also raises its price. In the past, high prices prevented corporate PCs from establishing a firm presence on our charts.

But a lot has changed in the course of a year. Not only have the prices of top-end CPUs quickly dropped (while their power has increased), but PC vendors who have recouped the expense of developing these corporate systems are passing the savings on to consumers in newer models. Now, even small companies can reap the rewards that corporate-minded PCs provide—without paying a premium for it.

This month, nine such systems made the *Top 20 Power Desktops* chart—at prices that give their small-office cousins a run for their money. With prices ranging from $2144 (for the 12th-place Acer Power 8000-450A) to $2794 (for HP's 18th-ranked Vectra VL Series 8), a reasonably priced, high-powered corporate machine is no longer just a pipe dream.

A powerful, moderately priced PC that's designed for a corporate environment is no longer just a pipe dream—nine of our Top 20 power desktops fit this description.

RUMPUS-ROOM PC: IBM's Aptiva E2N, our third-place family PC, is also the least expensive system on the home PCs chart.

'BUDGET' ISN'T ALWAYS BAD

BEING LABELED a budget system isn't necessarily an insult, as Micro Express can tell you. Two of the company's PCs earn budget Best Buys this month. The new MicroFlex-35A nabs first place, thanks to its speedy, inexpensive chip. Built with AMD's newest, fastest CPU—the K6-2-350—the MicroFlex-35A performed on a par with the average PII-350 system in our PC WorldBench 98 tests. Its $1349 price is the lowest of any 350-MHz machine on the chart. The PII-400 MicroFlex B2400B claims the fourth spot on the budget Top 20.

But with power-packed systems more affordable than ever, living with a moderate budget doesn't mean you have to settle for a low-end computer. In recent months, PII-400 PCs have flooded the market, driving prices down across the board. Furthermore, competition from other CPUs (like AMD's K6-2-350) is forcing Intel to slash chip prices further; and reduced demand—caused in part by the financial crises in Asia—is keeping prices down.

HOMEWARD BOUND

THIS MONTH, we go beyond our usual *Top 10 Home PCs* and provide a full roundup, evaluating systems in home-office, family, and gaming categories (see "Home PCs for the Holidays," page 138).

Prices on home PCs are the lowest we've seen. Though none in our roundup fall into the much-hyped sub-$1000 category, a few come close. For instance, IBM's K6-2-266–based Aptiva E2N places third in our family category and costs just $1048—the lowest price of all the ranking home systems this month. If you need more power, Packard Bell's Multimedia 945 costs just $130 more, and it offers dramatically higher speed, thanks to its quick Celeron-333 CPU.

Home PC buyers often sacrifice the performance of a standard business machine for low price and easy setup. If you're a serious gamer, however, you'll want the fastest processor and a 3D-accelerated

Find an expanded roundup of the best-of-breed home systems in "Home PCs for the Holidays" on page 138.

MULTIPURPOSE MASTER: Toshiba's Tecra 8000 offers travelers the most options for batteries and removable storage drives among laptops with multipurpose bays.

graphics card. In that case, you'll pay two to three times the price of a family or home-office PC—full-featured entertainment systems cost $2700 to $3200.

PRINTERS MAKE THE SWITCH

THIS MONTH MARKS a key change in a monthly Top 10 list. Until now, our *Top 10 Printers* chart has alternated between workgroup printers and personal printers. Our new scheme will alternate between color and monochrome printers.

But because of the variation among the uses (and capabilities) of these printer categories, we're also dividing each month's *Top 10 Printers* into two sections: printers for small and home offices, and printers for business. Monochrome printer charts will feature an equal number of workgroup and SOHO products. In contrast, color printer charts—including this month's—will consist of seven SOHO offerings and three corporate color printers, reflecting the relatively small selection of color units designed for business use.

The main differences between a corporate-minded printer and one made for the home? Corporate printers have special LAN hardware and more internal memory to queue print jobs. They're also larger, print faster, and hold more paper than their SOHO siblings. Business printers range from $300 to $800 for a near–laser-quality ink jet, up to $3500 to $5000 for a color laser printer; home printers cost a half to a third of those top-tier prices.

NIMBLE NOTEBOOKS

THOUGH SEVERAL LAPTOPS have multipurpose bays that let users add a supplemental battery or a CD-ROM drive, the latest trend for laptops is to use notebooks' expansion bays to connect more devices. Mobile users have several options available, from 120MB SuperDisk floppy drives to DVD players. Whether you want to watch a movie on a flight or make lots of backups, now you'll likely find the portable you want with the multipurpose bay drives you need. Among laptops that have these bays, Toshiba's $3499 Tecra 8000 offers the most removable-storage options. For the full story, check out *Top 10 Notebook PCs*, page 226.

Andrew Brandt and Michelle Campanale are associate editors for PC World. *Senior Associate Editors Vince Bielski, Bryan Hastings, and Karen Silver; Associate Editor Cameron Heffernan, Staff Editor Grace Aquino; Assistant Editor Mick Lockey; Editorial Assistant Kalai Murugesan; and freelance writers James Martin and Gordon Meyer contributed to the* Top 100 *this month. Ulrike Diehlmann, Robert James, Elliott Kirschling, Jeff Kuta, Nancy Miller, and Mike Salayko of the PC World Test Center performed testing for the Top 100. See page 14 for contact information.* ▶

YOUR GUIDE TO THE TOP 100

QUESTIONS ABOUT OUR CHARTS? The following section should answer most of them.

How do the charts work? The Top 20 and Top 10 charts are evolving lists of the best PCs, printers, monitors, graphics boards, and modems we've tested. System charts are divided by price. Power desktops cost $2000 or more; power notebooks cost $2750 or more. We compare new products to previously reviewed hardware, updating the charts to reflect price cuts and other changes.

Where do you get your prices? We estimate street prices based on vendor information and our own research, including surveys of retail outlets. We recheck all prices every month.

What does the overall rating mean? This 100-point scale reflects results from our hands-on evaluations and performance tests. A score in the 90s is exceptional, while one in the 80s is among the best and one in the 70s above average.

What does the PC WorldBench 98 score mean? It's a measure of how fast a PC is in relation to our baseline machine, a Gateway PMMX-200 configured with 32MB of RAM, a 2GB hard drive, and 512KB of secondary cache. A PC that scores 200, for instance, is twice as fast as the baseline system.

Where do the scores for reliability, support quality, and support policies come from? Reliability and support quality scores are based on surveys of *PC World* readers and anonymous support calls made by *PC World* staff. The policies score is based on vendor support policies.

What do all those word scores mean? Word scores for performance and price are based on a product's rating in relation to other products in its category. For instance, we score the performance of Windows NT PCs separately from that of Windows 95 machines. (Based on our PC WorldBench 98 tests, Windows NT machines are faster on average than Win 95 PCs.)

Check out *PC World's* Top 400 reviews online. Point your browser to PC World Online (www.pcworld.com/top400) to explore our Top 400, which provides comprehensive reviews and ratings for products in 16 different categories. You'll also find reviews not available in print.

PC WORLD

TOP 20 POWER DESKTOPS

	SYSTEM	Last month	Month tested	Street price (9/21/98)	CPU	Comments
1	Micron Millennia 400 Max 888/634-8799 www.micronpc.com	n/a	July 98	$2221	Pentium II-400	Speedy PII-400 sheds $427; sibling Millennia 450 Max is also a good deal.
2	Gateway GP6-400 800/846-2000 www.gateway.com	7	Nov 98	$2619	Pentium II-400	Price cut of $164 propels network-ready, multimedia-savvy PII-400 up the chart.
3	Dell OptiPlex GX1 400 800/289-3355 www.dell.com	3	Aug 98	$2403	Pentium II-400	Powerful corporate desktop with modular design now costs $301 less.
4	Dell Dimension XPS R450 800/388-8542 www.dell.com	1	Nov 98	$2561	Pentium II-450	Strong performer with great support policies upgrades to 4.8X DVD-ROM.
5	MidWest Micro Business Solutions 400 800/728-8582 www.mwmicro.com	n/a	NEW	$2199	Pentium II-400	Inexpensive corporate PII-400 with NT has network card and SuperDisk drive.
6	Quantex QP6/400 SM-4x 800/896-4898 www.quantex.com	6	Sept 98	$2099	Pentium II-400	Affordable PII-400 with 19-inch monitor and great support policies drops $100.
7	NEC Direction SP B450 888/863-2669 www.necnow.com	n/a	NEW	$2799	Pentium II-450	Pricey PC benefits from top speed, 19-inch monitor, and great NEC reliability scores.
8	Sys Technology Performance Pro 450 800/613-9963 www.sys.com	n/a	NEW	$2699	Pentium II-450	Fastest Win 98 PII-450 has network card, 40X CD-ROM drive, and SuperDisk drive.
9	Micron ClientPro 400 888/634-8799 www.micronpc.com	4	Oct 98	$2249	Pentium II-400	Slowest PII-400 with Win NT is network-ready with built-in management.
10	Acma ZPower 6450 PII-450 800/786-6888 www.acma.com	9	Nov 98	$2385	Pentium II-450	Quick Win 98 system features a top-notch graphics card.
11	Compaq Deskpro EP 6400X 800/345-1518 www.compaq.com	5	July 98	$2175	Pentium II-400	Corporate speedster has network card, management features, convertible case.
12	Acer Power 8000-450A 800/733-2237 www.acer.com	n/a	NEW	$2144	Pentium II-450	Inexpensive PII-450 has great warranty and speed, but no modem or network card.
13	Gateway E-4200 400 800/779-2000 www.gateway.com	15	Sept 98	$2423	Pentium II-400	Corporate system with the works is more attractive after $400 price slash.
14	HP Brio 8500 PII-450 800/752-0900 www.hp.com	n/a	NEW	$2240	Pentium II-450	Fastest Win NT machine is affordable, has enhanced keyboard.
15	IBM PC 300PL 800/426-2968 www.ibm.com	13	Oct 98	$2627	Pentium II-400	Network-equipped desktop has slick client-management tools, cramped interior.
16	Acma ZPower 7400 PII-400 800/786-6888 www.acma.com	n/a	Oct 98	$2398	Pentium II-400	Network-savvy midtower includes modem, but drive expansion is limited.
17	MidWest Micro Office Pro 400 800/728-8582 www.mwmicro.com	17	Oct 98	$2299	Pentium II-400	Office system sheds $410, includes SuperDisk drive.
18	HP Vectra VL Series 8 800/322-4772 www.hp.com	12	July 98	$2794	Pentium II-400	Despite subpar support policies, HP receives good scores for reliability and service.
19	PowerSpec PS-6331 888/480-3553 www.powerspec.com	16	Nov 98	$2068	Pentium II-400	Multimedia-heavy PC offers typical PII-400 performance and a $100 price cut.
20	CompUSA PII-450 888/226-6772 www.compusa.com	14	Nov 98	$2395	Pentium II-450	Average-priced PII-450 has top 3D graphics card but only fair support quality.

Best Buy See features chart, page 208; test report, page 210.

n/a = not applicable

[1]A system's performance word score is relative to scores of other PCs running the same operating system. For more details see "Your Guide to the Top 100" on page 205.

[2]For more information about all products in this table, select InfoNet no. 904 or visit www.pcworld.com/Infonet.

NEW PENTIUM II-450 PCs continue to roll onto the power chart, but PII-400s still dominate Best Buy territory thanks to some steep price cuts: Our number one Micron Millennia 400 Max plunges $427, and the runner-up Gateway GP6-400 drops $164. Other systems stand out in other ways. The fifth-place MidWest Micro and eighth-ranked Sys Technology units each come with a 120MB SuperDisk drive instead of the traditional floppy drive. During a month in which the prices of some PII-400s fell to below $1550, Premio's Apollo BX 400 broke the bank (and missed the chart). At $3900 this newcomer costs $1101 more than the most expensive system here, NEC's seventh-place Direction SP B450.

SCORECARD

★ Overall rating	PC WorldBench 98/operating system	Performance [1]	Features and design	Vendor's system reliability	Price	Vendor's support quality/policies	InfoNet number [2]
87	210/Win 95	outstanding	good	good	inexpensive	good/good	641
87	203/Win 98	very good	good	good	expensive	fair/outstanding	642
85	244/Win NT 4.0	very good	good	good	average	good/outstanding	643
85	212/Win 98	outstanding	good	good	average	good/outstanding	644
84	233/Win NT 4.0	very good	good	[3]	inexpensive	good [4]/good	645
83	199/Win 95	good	good	[3]	inexpensive	fair [4]/outstanding	646
83	220/Win 98	outstanding	good	outstanding	expensive	good [4]/good	647
83	222/Win 98	outstanding	good	[3]	expensive	good [4]/good	648
83	228/Win NT 4.0	good	good	good	average	good/good	649
83	217/Win 98	outstanding	good	[3]	average	[3]/outstanding	650
82	200/Win 95	very good	satisfactory	good	inexpensive	fair/outstanding	651
82	216/Win 98	outstanding	satisfactory	fair	inexpensive	fair/good	652
81	190/Win 98	good	good	good	average	fair/outstanding	653
81	263/Win NT 4.0	outstanding	satisfactory	good	average	good/good	654
81	207/Win 95	very good	good	fair	expensive	good/good	–
80	198/Win 95	good	good	[3]	average	[3]/outstanding	655
80	199/Win 95	good	good	[3]	average	good [4]/good	656
80	207/Win 95	very good	good	good	expensive	good/poor	657
79	202/Win 98	very good	good	[3]	inexpensive	fair [4]/good	658
77	203/Win 98	very good	good	[3]	average	fair [4]/good	659
Scorecard weightings ▶		Performance 25 percent	Features 25 percent	Reliability 15 percent	Price 15 percent	Quality/policies 10 percent each	

[1] Insufficient data to give a rating.

[4] Scores were derived from anonymous support-quality calls due to insufficient data from survey.

This Month's Best Buys

1 MICRON MILLENNIA 400 MAX

PRO: Fastest PII-400 running Win 95 or 98, nice design, Zip and DVD-ROM drives, inexpensive

CON: Monitor could be better

After being the number one Best Buy for two months running, Micron's Millennia 400 Max was supplanted last month by the company's new Pentium II-450 model. Now a $427 price cut puts the 400 back on top as the best overall value. Back in July, when we first tested this system, it set the performance bar among PII-400 PCs. With a PC WorldBench 98 score of 210, it remains the fastest PII-400 system running Windows 95 or 98 we've ever tested. It's loaded with features, and our readers tell us the company's systems are reliable.

This Millennia unit even looks fast, with its chiseled curves and molded slots for the floppy, Iomega Zip, and DVD-ROM drives. The back of the system features color-coded ports, and the case opens easily to reveal a tidy interior with plenty of open drive bays, card slots, and DIMM sockets.

Micron Millennia 400 Max

The Diamond Viper V330 Accelerated Graphics Port card delivers snappy graphics, but the 17-inch monitor is notably mediocre. Images appeared washed-out and a bit fuzzy at the edges. Micron bundles Advent AV390PL speakers and subwoofer with the 400. In our testing, sound quality was fine for common business use, but if you want to play music or sound clips, you'll have to crank up the volume to get any bass out of the subwoofer. Micron also throws in Microsoft's Office 97 Small Business Edition at the 400 Max's $2221 price.

Beyond the manuals for individual components, documentation for the Millennia 400 Max is sparse. On the other hand, Micron's support policies are first-rate, with a five-year warranty on the CPU and main RAM (three years on other parts), a one-year labor warranty, and 24-hour toll-free technical phone support.

2 GATEWAY GP6-400

PRO: Speedy system has both ethernet card and Iomega Zip drive included

CON: Slightly slower than top-ranked Micron Millennia 400 Max, support quality rated only fair

This month, Gateway's GP6-400 jumps five slots to second place, following a price cut of $164, to $2619. Equipped with a 19-inch monitor, an Iomega Zip drive, and a network card, the GP6-400 should satisfy power users and IS managers alike.

With a PC WorldBench 98 score of 203, the GP6-400 delivers Windows 98 performance that's just a hair slower than that of Micron's Millennia 400 Max. But whereas Micron's system comes with a modem, Gateway bundles a 100-megabits-per-second 3Com ethernet adapter. ▶

TOP 20 POWER DESKTOPS — STANDARD FEATURES

	SYSTEM	CPU	Operating system	RAM (MB)	Secondary cache (KB)	Hard drive (GB)	Graphics adapter (AGP)	Video RAM (MB/type)	Monitor tube/ viewable diagonal (inches)	Modem speed (kbps)
1	Micron Millennia 400 Max*	Pentium II-400	Windows 95	64	512	10	Diamond Viper V330	4/SGRAM	17/16	56 [2]
2	Gateway GP6-400*	Pentium II-400	Windows 98	128	512	14.4	ST8 Velocity 128	8/SGRAM	19/18	not included
3	Dell OptiPlex GX1 400*	Pentium II-400	Windows NT 4.0	64	512	6.4	integrated ATI 3D Rage Pro	8/SGRAM	17/15.9	not included
4	Dell Dimension XPS R450*	Pentium II-450	Windows 98	128	512	10	ST8 Velocity 128zx	8/SGRAM	17/16	56 [2]
5	MidWest Micro Business Solutions 400*	Pentium II-400	Windows NT 4.0	128	512	12.7	Matrox Millennium G200	8/SDRAM	17/15.8	not included
6	Quantex QP6/400 SM-4x	Pentium II-400	Windows 95	64	512	11	Real 3D StarFighter AGP	8/SGRAM	19/18	56 [4]
7	NEC Direction SP B450	Pentium II-450	Windows 98	64	512	14.4	Diamond Viper V550	16/SDRAM	19/17.9	56 [2]
8	Sys Technology Performance Pro 450	Pentium II-450	Windows 98	128	512	10.1	Matrox Mystique G200	8/SGRAM	17/15.8	56 [2]
9	Micron ClientPro 400	Pentium II-400	Windows NT 4.0	128	512	6.4	Diamond Viper V330	4/SGRAM	17/16	not included
10	Acma ZPower 6450 PII-450	Pentium II-450	Windows 98	128	512	10.1	Real 3D StarFighter AGP	8/SGRAM	17/16.1	56 [6]
11	Compaq Deskpro EP 6400X	Pentium II-400	Windows 95	64	512	6.4	Diamond Viper V330	4/SGRAM	17/16	56 [2]
12	Acer Power 8000-450A	Pentium II-450	Windows 98	64	512	8.4	ST8 Lightspeed 740	8/SDRAM	17/15.7	not included
13	Gateway E-4200 400	Pentium II-400	Windows 98	128	512	10	integrated ATI 3D Rage Pro	8/SGRAM	19/17.9	56 [2]
14	HP Brio 8500 PII-450	Pentium II-450	Windows NT 4.0	64	512	10.1	integrated ATI 3D Rage Pro	4/SGRAM	17/16	not included
15	IBM PC 300PL	Pentium II-400	Windows 95	64	512	9.1	Matrox Millennium II	8/WRAM	17/15.7	not included
16	Acma ZPower 7400 PII-400	Pentium II-400	Windows 95	64	512	14.4	Real 3D StarFighter AGP	8/SGRAM	17/16.1	56 [6]
17	MidWest Micro Office Pro 400	Pentium II-400	Windows 95	128	512	14.4	ATI Xpert@Play	8/SGRAM	17/15.7	56 [4]
18	HP Vectra VL Series 8	Pentium II-400	Windows 95	64	512	10	Matrox Productiva G100	4/SGRAM	17/15.9	not included
19	PowerSpec PS-6331	Pentium II-400	Windows 98	128	512	11.5	integrated Permedia-2	8/SGRAM	17/16	56 [4]
20	CompUSA PII-450	Pentium II-450	Windows 98	64	512	9.6	Real 3D StarFighter AGP	8/SGRAM	19/17.6	56 [4]

* Best Buy

[1] *PC World* defines towers as taller than 20 inches, midtowers as 15.5 inches to 20 inches, and minitowers as shorter than 15.5 inches.

[2] Downloads only, uploads at 33.6 kbps; uses 3Com/U.S. Robotics' x2 technology.

[3] Five years on CPU and main RAM, three years on other parts.

The GP6-400 also comes with Intel's LANDesk Client Manager software, making the system easy to monitor and set up remotely from a network administrator's PC.

Gateway GP6-400

The audio subsystem is surprisingly good for a business machine: The Boston Acoustic Micro Media System, consisting of a subwoofer and two palm-size satellite speakers, delivers terrific sound, from high treble to low bass. And the Ensoniq AudioPCI sound card doesn't take up a valuable ISA slot.

Gateway's GP6 systems have the same case style as the vendor's home-oriented G6-series PCs. A single thumbscrew provides access to the GP6-400's uncluttered interior and unobstructed memory slots. Color-coded ports located on the back of the machine simplify the process of connecting multiple cables.

Gateway's documentation gives you an entire volume on maintenance and troubleshooting, and includes a diagnostic CD-ROM and manual. The bundled discs, including Microsoft's Office 97 SBE, are nicely organized in a compact binder instead of in separate jewel cases. The vendor's around-the-clock support and three-year parts and labor warranty look good on paper, but our readers rated Gateway's support quality as just fair in our latest round of surveys.

3 DELL OPTIPLEX GX1 400

PRO: Well-designed corporate PC, easy access to interior, excellent monitor

CON: Video is not upgradable

The Dell OptiPlex GX1 400 isn't perfect, but it's the top corporate PC on our Power Desktops chart, and a $301 price cut helps keep the highly manageable midtower in third place. This $2403 system features integrated remote-management hardware, an easy-to-service design, and a notable (for comparable systems) PC WorldBench 98 score of 244. Dell's good system reliability and service quality scores make the OptiPlex GX1 an excellent addition to any IS manager's shopping list.

Dell OptiPlex GX1 400

		EXPANDABILITY				CUSTOMER SUPPORT			
CD/DVD-ROM drive speed	Sound board	Case style [1]	Max. RAM (MB)	Open RAM sockets	Open drive bays (ext./int.)	Open slots	Warranty for parts/labor (years)	Weekday toll-free support (hours)	Weekend support	Online support
2X DVD-ROM	integrated Crystal PnP	midtower	384	2	2/1	4	varies [3]/1	24	Sat., Sun.	BBS, CIS, WWW
13X-32X	Ensoniq AudioPCI	midtower	384	2	2/2	4	3/3	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
14X-32X	integrated Yamaha OPL3	midtower	384	2	2/1	7	3/3	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
4.8X DVD-ROM	Turtle Beach Montego	midtower	768	2	2/1	2	3/1	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
13X-32X	Ensoniq AudioPCI	midtower	384	2	3/1	3	varies [3]/3	24	Sat., Sun.	BBS, WWW
12X-32X	Ensoniq AudioPCI	midtower	384	2	3/3	3	3/1	24	Sat., Sun.	BBS, WWW
14X-32X	integrated Crystal PnP	midtower	384	2	3/1	4	3/3	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
17X-40X	Sound Blaster AWE64	midtower	1024	3	3/2	4	varies [5]/5	24	Sat., Sun.	WWW
20X-32X	integrated Crystal PnP	midtower	384	2	3/1	4	varies [3]/1	24	Sat., Sun.	BBS, CIS, WWW
12X-32X	integrated Crystal PnP	midtower	384	2	0/1	3	3/1	24	Sat., Sun.	BBS, WWW
12X-24X	integrated ESS1868	desktop	384	2	1/1	4	3/1	24	Sat., Sun.	AOL, BBS, CIS, WWW
12X-32X	integrated Crystal PnP	midtower	384	1	2/2	4	3/3	24	Sat., Sun.	BBS, WWW
13X-32X	Ensoniq AudioPCI	midtower	384	2	3/2	2	3/3	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
20X-32X	Aztech AZT2320	midtower	384	2	3/0	3	3/90 days	24	Sat., Sun.	AOL, CIS, WWW
14X-32X	integrated Crystal PnP	desktop	384	2	1/0	4	3/1	24	Sat., Sun.	AOL, BBS, CIS, WWW
12X-32X	integrated Crystal PnP	midtower	384	2	0/1	3	3/1	24	Sat., Sun.	BBS, WWW
14X-32X	Aureal A30 PCI	midtower	384	2	3/1	4	varies [3]/3	24	Sat., Sun.	BBS, WWW
12X-32X	HP Audio (AZT 1008)	midtower	384	1	2/1	4	3/1	[7]	none	AOL, BBS, CIS, WWW
12X-32X	Aureal A30 PCI	midtower	384	2	2/1	4	1/1	17	Sat., Sun.	BBS, WWW
2X DVD-ROM	Aureal A30 PCI	midtower	384	2	3/1	4	varies [8]/1	24	Sat., Sun.	WWW

[4] Downloads only, uploads at 33.6 kbps; uses Rockwell-Lucent's K56flex technology.

[5] Six year on CPU and main RAM, one to five years on other parts.

[6] Downloads only, uploads at 33.6 kbps; uses cross-compatible V.90 standard.

[7] HP's offering of 11 hours of weekday support is not toll-free.

[8] Lifetime warranty on CPU, five years on all other parts.

With the OptiPlex's modular case design, every part of the PC swivels, glides, or swings open for easy access. Removing the cover is literally a snap: Just press a button on the front and flick the case-lock switch at the back, and the cover swings up and out of the way. Expansion cards are mounted on a separate chassis that slides out as you press a lever—no scraped knuckles here. The power supply pivots upward to provide easy access to RAM slots and the motherboard. The only mark against the OptiPlex is its integrated 2X AGP graphics chip from ATI; you can't remove or upgrade it (though you can add extra video memory).

But upgrading shouldn't be in the cards for some time. The 6.4GB hard disk is sufficient for most uses, even though we're seeing larger drives on other top-end systems). Dell's Ultrascan 1000HS monitor, one of the best 17-inch Trinitron displays available, offers excellent image quality.

Dell ships the OptiPlex with Windows NT 4.0 and covers the PC with a three-year warranty on parts and labor. The firm's tech support lines operate nonstop.

4 DELL DIMENSION XPS R450

PRO: Impressive performance, upgraded DVD-ROM drive and video memory

CON: Included subwoofer is somewhat large

If you're venturing away from the corporate fold, Dell's top-of-the-line Windows 98 midtower is a terrific choice. Dell upgraded this system with one of the new, faster 4.8X DVD-ROM drives and increased the video memory from 4MB to 8MB, while decreasing the price slightly by $18, to $2561. The Dimension's speed, multimedia features, and good reliability and support ratings make it one of our top choices for small businesses or home offices.

Dell Dimension XPS R450

This Dimension sports the fastest processor currently available, the 450-MHz Pentium II, and it shows: The R450 slung bloatware like Microsoft Word and Internet Explorer onto the screen almost instantly. Its outstanding PC WorldBench 98 score of 212 is one of the fastest among PII-450 systems. You also get a 10GB hard drive—plenty of space to store ▶

bulky files—plus an Iomega Zip drive.

Multimedia capability is one of the XPS R450's strengths. DVD video played back smoothly, thanks to the included MPEG-2 decoder board. The substantial 128MB of RAM and 17-inch Trinitron monitor also helped. Even during fast-motion scenes and with a half-dozen applications churning in the background, playback was flawless. The Altec Lansing ACS295 speaker-subwoofer combo was a little thin on bass, but the sound was powerful and crisp, and the tone was as clear as a bell. Just make sure you have enough room under your desk—the subwoofer is the size of a small microwave oven.

In every other respect, the Dimension XPS R450 is a nicely built system. It comes with well-written manuals (which we hardly needed for setup, owing to clearly labeled and color-coded cables), and Dell backs the XPS R450 with a support policy that includes around-the-clock technical phone support.

5 MIDWEST MICRO BUSINESS SOLUTIONS 400

PRO: Inexpensive, comes with outstanding speakers and SuperDisk drive

CON: Performance is somewhat lackluster for a PII-400 running Win NT

Make no mistake about it—the $2199 Business Solutions 400 is a serious machine with fun on its mind. Running Windows NT, the system scored 233 on our PC WorldBench 98 tests—about 2 percent faster than the ▶

TOP 20 POWER DESKTOPS

TEST REPORT

	SYSTEM	CPU	Operating system	RAM (MB)	Secondary cache (KB)	PC World-Bench 98 score
1	Micron Millennia 400 Max*	Pentium II-400	Win 95	64	512	210
2	Gateway GP6-400*	Pentium II-400	Win 98	128	512	203
3	Dell OptiPlex GX1 400*	Pentium II-400	Win NT 4.0	64	512	244
4	Dell Dimension XPS R450*	Pentium II-450	Win 98	128	512	212
5	MidWest Micro Business Solutions 400*	Pentium II-400	Win NT 4.0	128	512	233
6	Quantex QP6/400 SM-4x	Pentium II-400	Win 95	64	512	199
7	NEC Direction SP B450	Pentium II-450	Win 98	64	512	220
8	Sys Technology Performance Pro 450	Pentium II-450	Win 98	128	512	222
9	Micron ClientPro 400	Pentium II-400	Win NT 4.0	128	512	228
10	Acma ZPower 6450 PII-450	Pentium II-450	Win 98	128	512	217
11	Compaq Deskpro EP 6400X	Pentium II-400	Win 95	64	512	200
12	Acer Power 8000-450A	Pentium II-450	Win 98	64	512	216
13	Gateway E-4200 400	Pentium II-400	Win 98	128	512	190
14	HP Brio 8500 PII-450	Pentium II-450	Win NT 4.0	64	512	263
15	IBM PC 300PL	Pentium II-400	Win 95	64	512	207
16	Acma ZPower 7400 PII-400	Pentium II-400	Win 95	64	512	198
17	MidWest Micro Office Pro 400	Pentium II-400	Win 95	128	512	199
18	HP Vectra VL Series 8	Pentium II-400	Win 95	64	512	207
19	PowerSpec PS-6331	Pentium II-400	Win 98	128	512	202
20	CompUSA PII-450	Pentium II-450	Win 98	64	512	203

*Best Buy

Word 97 · Word Pro 97 · Excel 97 · 1-2-3 97 · Paradox 8.0 · Picture Publisher 7.0

TEST PC WORLD CENTER **HOW WE TEST** All systems are tested with PC WorldBench 98, *PC World*'s application-based benchmark. A higher PC WorldBench score is better. All PCs are tested with Windows 95, Windows 98, or Windows NT 4.0, and video resolution is set to 800 by 600 in 65,536 colors. We run automated scripts on six popular business applications, performing common tasks such as spelling checks, scrolls, saves, sorts, and recalculations. The PC WorldBench 98 score is a sum of the weighted, normalized result of each script: Word 97 (10 percent), Word Pro 97 (10 percent), Excel 97 (20 percent), 1-2-3 97 (20 percent), Paradox 8.0 (20 percent), and Picture Publisher 7.0 (20 percent). For more details on our benchmark and how we run it, see PC World Online (www.pcworld.com/testing). [1]Under Windows 95.

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PII-400 ClientPro 400 from Micron. Not only will the Business Solutions 400 get work done during the business day, but its multimedia enhancements (including the first pair of Universal Serial Bus speakers we've seen in a Top 20 system and all the RAM you'll likely need) will keep this machine rocking into the night.

The PC's Matrox Millennium G200 graphics board claimed the top spot among AGP graphics boards in our November *Top 10 Graphics Boards* chart. The USB-based Altec Lansing ADA-305 speakers come as a three-piece set with a boxy subwoofer and a pair of Frank Lloyd Wright–inspired satellite speakers. While the USB speakers sound great and don't require a sound card to work, MidWest Micro also packs an Ensoniq AudioPCI sound card, so you don't have to throw out your non-USB speakers.

Business Solutions 400

Though the Business Solutions 400's WorldBench score of 233 is higher than the 228 earned by Micron's ClientPro 400, two other PII-400 Windows NT systems (with only 64MB of memory) scored better: Dell's OptiPlex GX1 400 is nearly 5 percent faster at 244, while Sys Technology's Performance Pro 400BA scored a blazing 252, more than 8 percent faster than the MidWest Micro. Nevertheless, the MidWest Micro system costs about $400 less than the faster ones from Dell and Sys Technology.

The Business Solutions 400 fits well into any corporate environment whose plans don't include PC management. The system comes with a 3Com ethernet adapter for quick connections to the corporate LAN, but it's missing management features like DMI 2.0 support. On the other hand, it's quick and easy to archive important business files on this PC. MidWest Micro bundles a SuperDisk drive in place of the standard 1.44MB floppy disk, so you can read and write to standard floppies as well as to 120MB SuperDisk media.

Servicing and upgrading the Business Solutions 400 is simple enough: You can open the case without tools, and you have unfettered access to every slot and bay. Four of the seven drive bays are available, as are three of the six expansion slots. The PC comes with a great set of manuals that provide quick out-of-the-box setup instructions (in both a colorful, well-diagrammed manual and a large foldout poster), plus more technical upgrade information, such as a motherboard guide.

MidWest Micro offers a parts warranty that covers the CPU and main RAM for five years (other parts for three years), a three-year labor warranty, and around-the-clock tech support. We've received little feedback on the reliability of MidWest Micro systems, but the quality of the vendor's support appears to be good. In our anonymous support calls to tech support, the staff seemed knowledgeable, though they rarely answered our questions unless we supplied a serial number.

New This Month

The following systems made our Power Desktops chart for the first time this month. For brief reviews of previously tested machines on the chart, visit our Web page (www.pcworld.com/top400).

7 NEC DIRECTION SP B450

PRO: Second-fastest Win 98 PC, high system reliability scores in reader surveys

CON: Sparse documentation, expensive, no DVD

Small to midsize businesses seeking speed and reliability should peruse the Direction SP B450. The system is quick and has impressive components, but its $2799 price is more than $200 above the average cost of some competing PII-450s. Still, the machine's easy setup, big 19-inch monitor, and high reliability scores, make it a good home-office PC.

NEC Direction SP B450

What do you get for paying top dollar? A massive 14.4-GB hard drive and a robust Diamond Viper V550 AGP graphics board with 16MB of video memory. Our sample system also included a 3Com/U.S. Robotics' x2 56-kbps modem with voice mail.

But some of the multimedia components left us scratching our heads: The Altec Lansing ACS45W speaker-subwoofer set, for example, produced rich tones, but powering it on wasn't intuitive, and very little documentation was available. For the price of this system, we also expected to receive a DVD-ROM drive instead of a 14X–32X CD-ROM drive.

Based on our calls and surveys, you probably won't need to use NEC's three-year parts and labor warranty or call its around-the-clock toll-free support. NEC claimed the top score in our last system reliability survey, and got a good rating for the quality of its service. In our anonymous calls, we waited on hold for as little as 4 minutes and obtained useful advice.

8 SYS TECHNOLOGY PERFORMANCE PRO 450

PRO: Fastest PII-450 running Windows 98; includes SuperDisk drive, 40X CD-ROM drive

CON: No bundled office suite, pricey

Sys Technology's Performance Pro 450 is a general-use PC that may appeal to power users. Its PC WorldBench 98 score of 222 is higher than that of any Windows 98 system we've tested, and about 3 percent faster than the average 450-MHz PC.

Performance Pro 450

But you pay for the speed: At $2699, this Performance Pro costs about $100 more than the average price of comparable PCs. And while four other PII-450s we've tested are more expensive, most come with a good software bundle and a DVD-ROM drive, as the fourth-place Dell does.

Still, the Performance Pro has the only 40X CD-ROM drive on the chart. And like number five MidWest Micro PC, it comes with a SuperDisk drive instead of a 3.5-inch floppy drive, giving you backward compatibility with standard floppies and storage on 120MB removable media.

The Sound Blaster AWE64 audio card is a good choice, but you can forget about listening to music—the Performance Pro's below-average Mli-818 speakers are useful only for the alert sounds you encounter in Windows. On a brighter ▶

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note, the Matrox Mystique G200 AGP graphics card is a nice match with Sys's SPM-17-MS 17-inch monitor. Images looked crisp, sharp, and bright.

The bundled software could be better. Aside from some drivers, a "Windows 98 Starts Here" orientation CD, and what comes with Win 98 itself, the PC includes no extra utilities like antivirus software. We were also disappointed with the documentation, which consisted only of hard-to-read individual component manuals.

Acer Power 8000-450A

You need a screwdriver to get inside the PC, but the interior is clean and easy to work in. The system has a surprisingly large number of free expansion slots, drive bays, and RAM sockets.

The company offers a long warranty on parts and labor, plus 24-hour phone support. In our anonymous calls, we found Sys Technology's support technicians friendly and helpful, but not very forthcoming with information if we didn't provide a serial number. Furthermore, one technician gave us a toll number (instead of the toll-free support line), and another wouldn't help us unless we had the system in front of us.

12 ACER POWER 8000-450A

PRO: Inexpensive, fast PII-450 system

CON: Support quality could be better, difficult-to-close case, poor interior design and speakers

Priced more than $300 below the average price of a comparable PII-450 system, Acer's $2144 Power 8000-450A is the latest in the company's corporate line of speedy business-oriented machines. Its PC WorldBench 98 score of 216 means that the performance of the Power 8000-450A is about average when compared to other PII-450 systems we've tested with the Windows 98 operating system.

For the low price, you get a decently configured PC. The Power 8000-450A's components aren't top of the line, but they're not below average, either. The factory setup includes a large 8.4GB hard drive, a 17-inch AcerView 76c monitor, and an 8MB Intel I740 AGP video card. The display produced remarkable graphics and crisp text, with the additional benefit of easy-to-adjust controls. The video card's 8MB of video memory means you can set up your display with a wide 1280 by 1024 screen resolution and still enjoy full 32-bit color.

The system is easy to set up, thanks to color-coded and labeled ports on both the PC and the sound card—and that's good because the system manual makes no mention of either the speakers or the sound card. (The Acer comes with meager documentation overall.) The Acer-brand speakers sound a little better than the average clock radio; they sound fuzzier as the volume increases.

The Power 8000-450A we tested had some case-design problems. For example, we couldn't completely close the case, even though we followed the instructions in the manual to the letter. The inside of the Acer's chassis is also a hassle to deal with: The hard-drive mount blocks some of the expansion slots, which means you may have to move the drive to use all your free slots. Furthermore, the cables are disorganized, and the remaining usable space is cluttered.

HP Brio 8500 PII-450

Acer's three-year parts and labor warranty and around-the-clock technical phone support are similar to the warranty and policies of its competitors, but the quality of the company's support was pretty inadequate. In our anonymous calls, we had to wait 20 minutes or more to speak with a support technician, and in almost all cases the help we received was substandard. In our most recent surveys, our readers rated the reliability of Acer's systems and the quality of its support as only fair.

14 HP BRIO 8500 PII-450

PRO: Fastest Windows NT system to date is well priced, keyboard has extra hot-keys

CON: On-screen user guide is too technical for the average user, case is hard to remove

If you're looking for a powerful system for a small to medium-size business—and little more—put Hewlett-Packard's Brio 8500 PII-450 on your shopping list. This $2240 midtower is lean and fast. But the PC we evaluated was devoid of a modem, speakers, and software. And though the Brio includes a quick-start guide, the more detailed documentation comes as an electronic file on the PC. Still, this is one of the least expensive top-end Pentium II PCs running Windows NT 4.0 on our Top 20 chart. It's also the fastest by far, scoring 263 in our PC WorldBench 98 tests—a boggling 20 percent faster than the average comparable system.

The Brio could have just as easily been called the Brick. With a heavier-than-usual metal skin wrapped around a cross-braced frame, the case has almost no flex; it should weather office-cube reorganizations better than most systems. The Brio 8500 has two distinctive features. First, it's one of the few PCs we've seen that offer a CD-rewritable drive option—convenient for backing up data files onto 650MB CD-RW optical media as well as for reading standard CD-ROMs. Also, the keyboard has dedicated keys that allow one-touch access to your e-mail and browser.

Even though we think the Brio is an admirable office system, it does have a couple of drawbacks. For one thing, the case requires some fussing to remove—and lots more handling to replace. Any IS technician assigned to upgrade an office full of Brios may need to reach for painkillers by day's end. Also, the electronic documentation may be fine for a PC-savvy user, but it's too technical for most people.

PC World readers rate HP's support quality as good, and our anonymous calls were answered by knowledgeable reps. HP backs the Brio with 24-hour tech support and a three-year parts warranty, but it provides only a 90-day labor warranty. ▶

BEYOND THE TOP 20

We evaluated the following systems along with the others, but they didn't score high enough to reach the *Top 20 Power Desktops* chart. For write-ups, go to PC World Online (www.pcworld.com/t20pcs).

- **DTK Apri-80M/P400**
- **NexTrend AMD K6-2-350**
- **Premio Apollo BX 400**

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- 32MB SDRAM
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PC WORLD

TOP 20 BUDGET DESKTOPS

	SYSTEM	Last month	Month tested	Street price (9/21/98)	CPU	Comments
1	Micro Express MicroFlex-35A 800/989-9900 www.microexpress.net	n/a	NEW	$1349	AMD K6-2-350	Bargain price for a fast PC with robust multimedia components, great warranty.
2	Dell Dimension XPS R350 800/388-8542 www.dell.com	1	Nov 98	$1819	Pentium II-350	Fast Windows 98 PII-350 gets a $180 price cut and a new 4.8X DVD-ROM drive.
3	Gateway E-3200 400 800/779-2000 www.gateway.com	n/a	NEW	$1949	Pentium II-400	PII-400 with network card and excellent support policies is slow for an NT system.
4	Micro Express MicroFlex B2400B 800/989-9900 www.microexpress.net	6	Nov 98	$1599	Pentium II-400	Low price for a PII-400 with a 2X DVD-ROM drive and long warranty.
5	NEC Direction SP E333 888/863-2669 www.necnow.com	5	May 98	$1599	Pentium II-333	NEC's high reliability scores, $149 off accompany switch to 14X-32X CD-ROM drive.
6	Dell Dimension V333c 800/388-8542 www.dell.com	8	Nov 98	$1849	Celeron-333	Relatively pricey Celeron-333 PC now has a 4.8X DVD-ROM drive and Zip drive.
7	CyberMax Entrepreneur PII-300 800/437-4596 www.cybermaxpc.com	2	May 98	$1499	Pentium II-300	Well-supported PII-300 system with Iomega Zip drive, big 8.4GB hard disk.
8	Quantex QP6/333 SM-3x 800/846-4898 www.quantex.com	10	Aug 98	$1449	Pentium II-333	Lots of expansion room in a basic midtower; $200 price cut brings it up the chart.
9	CyberMax Entrepreneur MII-300 800/437-4596 www.cybermaxpc.com	n/a	Sept 98	$1199	Cyrix M II-300	Good value and PII-300 performance from a Cyrix-based PC.
10	MidWest Micro Office Pro 350 800/728-8582 www.mwmicro.com	18	Nov 98	$1635	Pentium II-350	Fast PII-350 drops $244 thanks to CPU price cuts; includes 120MB SuperDisk drive.
11	Quantex QP6/400 SM-3x 800/846-4898 www.quantex.com	n/a	Oct 98	$1949	Pentium II-400	Affordable PII-400 with Zip drive, nice-looking monitor, great support policies.
12	Unicent Avanta E333 800/308-3614 www.unicent.com	12	Nov 98	$1111	Celeron-333	Cheapest budget system on chart has basic configuration, could have better support.
13	Acma NPower 6333 800/786-6888 www.acma.com	9	Aug 98	$1470	Pentium II-333	Outstanding support policies and $129 price cut keep quick PII-333 on chart.
14	Quantex QP6/350 M-4x 800/896-4898 www.quantex.com	n/a	Sept 98	$1799	Pentium II-350	Software-laden PII-350 comes with large 19-inch monitor and internal Zip drive.
15	CyberMax Entrepreneur PII-333 800/437-4596 www.cybermaxpc.com	n/a [5]	Aug 98	$1899	Pentium II-333	3D graphics powerhouse moves to budget chart, includes 128MB of RAM.
16	NextPC N6-350 PII 350 888/838-7827 www.next-pc.com	19	Oct 98	$1586	Pentium II-350	Substantial $163 price drop on fast small-office system; no online support.
17	Unicent Avanta L333 800/308-3614 www.unicent.com	14	June 98	$1599	Pentium II-333	Relatively slow PII-333 costs $50 less this month; phone support could be better.
18	Compaq Deskpro EP C333 800/345-1518 www.compaq.com	16	Nov 98	$1883	Celeron-333	Even with a $42 price cut, Celeron-333 PC with top-notch components is still pricey.
19	Polywell Poly K6266Mx 800/999-1278 www.polywell.com	n/a	May 98	$1230	AMD K6-266	This 266-MHz AMD K6 has 56-kbps modem, 3D graphics; costs more than faster PCs.
20	HP Brio 7100 800/752-0900 www.hp.com	n/a	Nov 98	$1222	Celeron-300A	Inexpensive, powerful network-ready Celeron PC has little room for expansion.

Best Buy See features chart, page 218; test report, page 220.

n/a = not applicable

[1] A system's performance word score is relative to scores of other PCs running the same operating system. For more details see "Your Guide to the Top 100" on page 205.

[2] For more information about all products in this table, select InfoNet no. 905 or visit www.pcworld.com/infonet.

PRICE CUTS on Intel CPUs are bringing more Pentium II-400 PCs into the budget category, and some of the new prices are astounding. Micro Express's MicroFlex B2400B, for example, costs a hair under $1600, and it includes a DVD-ROM drive. Looking for a real bargain in a PC with good speed? Micro Express's MicroFlex-35A costs $250 less than the B2400B, and its new AMD K6-2-350 CPU gives it PII-350–like performance. We tested two other K6-2-350 systems this month, but neither made the budget chart. Polywell's $1995 K6-2-350GX is just too expensive for what you get. A better value for corporate buyers is the third-ranked Gateway E-3200 400, a $1949 PII-400 NT machine that has built-in networking.

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SCORECARD

★ Overall rating	PC WorldBench 98/operating system	Features and design	Price	Performance [1]	Vendor's system reliability	Vendor's support quality/policies	InfoNet number [2]
84	179/Win 98	good	inexpensive	very good	[3]	fair [4]/outstanding	660
83	188/Win 98	satisfactory	expensive	very good	good	good/outstanding	661
82	224/Win NT 4.0	satisfactory	expensive	outstanding	good	fair/outstanding	662
81	201/Win 98	good	average	outstanding	[3]	fair [4]/outstanding	663
81	169/Win 95	satisfactory	average	good	outstanding	good [4]/good	664
81	170/Win 98	satisfactory	expensive	good	good	good/outstanding	665
80	152/Win 95	very good	average	good	[3]	good [4]/outstanding	666
79	164/Win 95	very good	average	good	[3]	fair [4]/outstanding	667
79	161/Win 95	good	inexpensive	good	[3]	good [4]/outstanding	668
79	186/Win 98	good	average	very good	[3]	good [4]/good	669
78	198/Win 95	good	expensive	outstanding	[3]	fair [4]/outstanding	670
78	171/Win 98	satisfactory	inexpensive	good	[3]	fair [4]/outstanding	671
78	177/Win 95	satisfactory	average	good	[3]	[3]/outstanding	672
78	186/Win 95	good	expensive	very good	[3]	fair [4]/outstanding	673
77	171/Win 95	good	expensive	good	[3]	good [4]/outstanding	674
77	181/Win 95	satisfactory	average	very good	[3]	fair [4]/good	675
77	158/Win 95	good	average	good	[3]	fair [4]/outstanding	676
77	176/Win 98	satisfactory	expensive	good	good	fair/outstanding	677
77	145/Win 95	satisfactory	inexpensive	good	[3]	fair [4]/fair	678
76	163/Win 98	satisfactory	inexpensive	good	good	good/good	679
Scorecard weightings ▶		Features 25 percent	Price 22 percent	Performance 18 percent	Reliability 15 percent	Quality/policies 10 percent each	

[3] Insufficient data to give a rating.

[4] Scores were derived from anonymous support-quality calls due to insufficient data from survey.

[5] System was number 20 on November power chart.

This Month's Best Buys

1 MICRO EXPRESS MICROFLEX-35A

PRO: Great price, warranty, and speakers

CON: Hard-to-open case, so-so monitor quality

If the local fortune-teller dabbled in PC forecasts, she'd take one look at the Micro Express MicroFlex-35A and say: "I see a computer with an orderly nature, an ear for music, and a long life." This Best Buy PC features a nicely arranged and spacious interior, a powerful audio subsystem, and a long parts and labor warranty. With the MicroFlex-35A, Micro Express offers the budget-conscious power user a convincing triad of high-quality components, strong performance, and great price.

At just $1349, this machine is truly a bargain. You'd pay about $475 more for a comparably equipped system with a PII-350 processor. Inside the MicroFlex-35A's plain, beige midtower case hums a 350-MHz K6-2 processor—the fastest chip yet from AMD. Our benchmark tests prove that you don't sacrifice speed for the low price: With a PC WorldBench 98 score of 179, the MicroFlex performs like an average PII-350 system.

Despite its modest price, the MicroFlex-35A is well equipped. The combination of a 7.5GB hard disk, a 56-kbps modem, and a 12X–32X CD-ROM drive make it suitable for most business applications. And if you build heavy-duty multimedia presentations, you'll probably be tickled pink with the Diamond Multimedia Viper V330 AGP graphics adapter—the Viper series often makes our *Top 10 Graphics Boards* chart. The MicroFlex's audio system is powerful, too: Creative Labs' new Sound Blaster PCI-128 audio card is able to literally surround you with sound when it's connected to a four-speaker system. Our test machine included Altec Lansing's ACS44 Powercube two-speaker system. Although we were two speakers short to take full advantage of the sound card's abilities, the resulting acoustics were terrific.

MicroFlex-35A

A 17-inch Impression 7V color monitor accompanies the MicroFlex-35A. In our tests, text and graphics looked crisp, even though the monitor we reviewed appeared to have been damaged in transit: A bluish cast persisted despite our efforts to eliminate it. We're sure that an undamaged monitor wouldn't have this problem.

The MicroFlex-35A's spacious interior is so clean and well organized, you'd think a drill sergeant had designed it. If only getting inside was simpler—you have to remove four Phillips screws, and then lift off the three-sided steel case. Reseating the cover is even more difficult. We experienced problems aligning it and sliding it securely back in place.

The MicroFlex comes with a variety of helpful manuals. As for the fortune- ▶

PHOTOGRAPHS: KEN SMITH

TOP 20 BUDGET DESKTOPS — STANDARD FEATURES

	SYSTEM	CPU	Operating system	RAM (MB)	Secondary cache (KB)	Hard drive (GB)	Graphics adapter (AGP)	Video RAM (MB/type)	Monitor tube/ viewable diagonal (inches)	Modem speed (kbps)
1	Micro Express MicroFlex-35A*	AMD K6-2-350	Windows 98	64	1024	7.5	Diamond Viper V330	4/SGRAM	17/15.9	56 [2]
2	Dell Dimension XPS R350*	Pentium II-350	Windows 98	64	512	10	STB Velocity 128zx	8/SGRAM	17/16	56 [4]
3	Gateway E-3200 400*	Pentium II-400	Windows NT 4.0	64	512	10	integrated ATI 3D Rage Pro Turbo	4/SGRAM	17/15.9	not included
4	Micro Express MicroFlex B2400B*	Pentium II-400	Windows 98	128	512	6.4	ATI Xpert@Play	8/SGRAM	17/16.1	56 [4]
5	NEC Direction SP E333*	Pentium II-333	Windows 95	64	512	6.4	integrated ATI 3D Rage Pro Turbo	4/SGRAM	17/16	56 [3]
6	Dell Dimension V333c	Celeron-333	Windows 98	64	128	6.4	integrated ATI 3D Rage Pro	8/SDRAM	17/15.9	56 [3]
7	CyberMax Entrepreneur PII-300	Pentium II-300	Windows 95	64	512	8.4	STB Velocity 128	4/SGRAM	17/16.1	56 [2]
8	Quantex QP6/333 SM-3x	Pentium II-333	Windows 95	64	512	6.4	STB Velocity 128	4/SGRAM	17/16.1	56 [2]
9	CyberMax Entrepreneur MII-300	Cyrix M II-300	Windows 95	64	512	8	integrated Permedia-2	8/SGRAM	17/15.7	56 [2]
10	MidWest Micro Office Pro 350	Pentium II-350	Windows 98	64	512	11.5	integrated ATI 3D Rage Pro	4/SGRAM	17/15.7	56 [4]
11	Quantex QP6/400 SM-3x	Pentium II-400	Windows 95	64	512	8.1	Real 3D StarFighter AGP	8/SGRAM	17/15.7	56 [2]
12	Unicent Avanta E333	Celeron-333	Windows 98	64	128	4.3	ATI Xpert@Work	4/SGRAM	15/13.7	56 [4]
13	Acma NPower 6333	Pentium II-333	Windows 95	64	512	6.4	Diamond Stealth 3D 2000	4/SGRAM	17/15.8	not included
14	Quantex QP6/350 M-4x	Pentium II-350	Windows 95	64	512	8.1	Real 3D StarFighter AGP	4/SGRAM	19/17.9	56 [2]
15	CyberMax Entrepreneur PII-333	Pentium II-333	Windows 95	128	512	8.4	STB GLyderMax-2	8/SGRAM	19/18	56 [2]
16	NextPC N6-350 PII 350	Pentium II-350	Windows 95	64	512	8.4	Card Expert Intel740	8/SDRAM	17/16	56 [3]
17	Unicent Avanta L333	Pentium II-333	Windows 95	64	512	8.4	ATI Xpert@Work	4/SGRAM	17/15.9	56 [3]
18	Compaq Deskpro EP C333	Celeron-333	Windows 98	64	128	10	Matrox Millennium G200	8/SDRAM	17/15.9	56 [2]
19	Polywell Poly K6266Mx	AMD K6-266	Windows 95	64	512	7	Diamond Stealth 3D	4/EDO DRAM	17/15.8	56 [2]
20	HP Brio 7100	Celeron-300A	Windows 98	64	128	3.2	integrated Matrox G100	2/SGRAM	17/15.6	not included

* Best Buy

[1] *PC World* defines towers as taller than 20 inches, midtowers as 15.5 inches to 20 inches, and minitowers as shorter than 15.5 inches.
[2] Downloads only, uploads at 33.6 kbps; uses Rockwell-Lucent's K56flex technology.

teller's long-life prediction, consider this: MicroFlex backs its PCs with an above-average four-year warranty on parts and labor, and one year of free on-site service. Toll-free phone support is available around the clock. In our anonymous calls to tech support, Micro Express's reps were helpful and well informed.

2 DELL DIMENSION XPS R350

PRO: Equipped with an updated DVD-ROM drive, organized interior, $180 price cut

CON: Pricey among PII-350 PCs

No longer the number one budget Best Buy, Dell's Dimension XPS R350 slips to second place this month despite a $180 price cut. At $1819, the Dimension XPS R350 costs about $200 more than the average PII-350 system. Still, it comes with powerful multimedia features and turns in a PC WorldBench 98 score of 188—the fastest score of all PII-350 systems we've seen.

Dell Dimension XPS R350

This month, Dell upgraded the Dimension with a new 4.8X DVD-ROM drive, though few applications are yet available on DVD. At the same time, Dell replaced the huge 14.4GB hard drive of the original XPS R350 with a smaller (though still substantial) 10GB hard disk. This reconfiguration allows the company to sell the system with the more expensive DVD-ROM drive at a lower price than the older model. The Dimension XPS R350 also now includes an MPEG-2 decoder card, where previously it came only with MPEG-2 decoding software.

The stunning Dell 1000LS 17-inch Trinitron monitor and fast STB Velocity 128zx graphics card deliver blazing graphics and smooth MPEG-2 video. The software bundle includes Microsoft's Office 97 Small Business Edition and Bookshelf reference collection—a suitable start for small to midsize businesses. You can substitute Microsoft's Encarta CD-ROM encyclopedia for the Bookshelf software at no additional cost, or upgrade to the Professional Edition of Office for $199 more.

The Dimension's midtower case is well designed and sturdy enough for use in a home office. It has a platform base, making it more stable without increasing its

		EXPANDABILITY					CUSTOMER SUPPORT			
CD/DVD-ROM drive speed	Sound board	Case style [1]	Max. RAM (MB)	Open RAM sockets	Open drive bays (ext./int.)	Open slots	Warranty for parts/labor (years)	Weekday toll-free support (hours)	Weekend support	Online support
12X-32X	Sound Blaster PCI-128	midtower	384	4	3/0	4	4/4	24	Sat., Sun.	WWW
4.8X DVD-ROM	integrated Crystal PnP	midtower	384	2	3/1	4	3/1	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
13X-32X	integrated Crystal PnP	desktop	384	2	0/0	1	3/3	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
2X DVD-ROM	Sound Blaster AWE64	midtower	384	1	3/0	4	4/4	24	Sat., Sun.	WWW
14X-32X	integrated Yamaha OPL3-Sax	midtower	384	1	3/1	4	3/3	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
4.8X DVD-ROM	Turtle Beach Montego	minitower	384	2	2/1	1	3/1	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
13X-32X	Ensoniq AudioPCI	midtower	512	2	3/3	4	3/1	24	Sat., Sun.	BBS, WWW
12X-32X	Ensoniq AudioPCI	midtower	384	2	3/3	4	3/1	24	Sat., Sun.	BBS, WWW
14X-32X	Ensoniq AudioPCI	midtower	256	5	3/3	3	3/1	24	Sat., Sun.	BBS, WWW
14X-32X	Ensoniq AudioPCI	midtower	384	2	3/1	4	varies [5]/3	24	Sat., Sun.	BBS, WWW
12X-32X	Ensoniq AudioPCI	midtower	384	2	2/3	4	3/1	24	Sat., Sun.	BBS, WWW
12X-24X	integrated Yamaha OPL3-Sax	minitower	256	1	2/0	2	3/3	24	Sat., Sun.	BBS, WWW
12X-32X	Yamaha OPL3-Sax	desktop	384	2	0/0	3	3/1	24	Sat., Sun.	BBS, WWW
12X-32X	Ensoniq AudioPCI	midtower	384	2	2/3	4	3/1	24	Sat., Sun.	BBS, WWW
14X-32X	Ensoniq AudioPCI	midtower	384	1	2/3	4	3/1	24	Sat., Sun.	BBS, WWW
14X-36X	integrated Ensoniq AudioPCI	midtower	768	2	2/3	5	varies [6]/3	24	Sat., Sun.	none
13X-32X	Ensoniq AudioPCI	midtower	384	2	3/1	4	3/3	24	Sat., Sun.	BBS, WWW
12X-32X	integrated ESS1869	desktop	256	1	1/1	3	3/1	24	Sat., Sun.	AOL, BBS, CIS, WWW
12X-24X	CS37-3DIS	midtower	256	4	3/0	4	3/5	24	Sat., Sun.	WWW
12X-32X	integrated Yamaha OPL3-Sax	minitower	256	1	0/0	2	3/90 days	24	Sat., Sun.	AOL, CIS, WWW

[3] Downloads only, uploads at 33.6 kbps; uses 3Com/U.S. Robotics' x2 technology.
[4] Downloads only, uploads at 33.6 kbps; uses cross-compatible V.90 standard.
[5] Five years on CPU and main RAM, three years on other parts.
[6] One year on CPU, RAM, speakers, and monitor; three years on other parts.

width. The interior is laid out nicely, with a fan that blows air directly onto the CPU's large heat sink—an important feature that can prevent the processor from overheating (and possibly causing errors) during long computing sessions.

Dell's intelligently written documentation includes troubleshooting manuals and a foldout setup guide.

In *PC World* surveys, readers rate the quality of Dell's 24-hour toll-free phone support as good, but the picture is not entirely rosy for the company. Our anonymous callers to Dell's support lines rated service as just adequate for accuracy, responsiveness, and courteousness. And when one of our callers asked a support technician some intermediate-level questions about hard disk compression and the system's bundled V.90 modem, the technician responded with cryptic or incorrect answers. Furthermore, we've experienced increased hold times in our anonymous calls to Dell's support over the past year.

3 GATEWAY E-3200 400

PRO: Well-supported corporate PII-400 system, interior is easy to access

CON: Subpar performance for a Win NT PII-400, limited expansion, mediocre monitor

Corporate PC buyers in the market for a high-quality, relatively inexpensive managed PC should seriously consider Gateway's new E-3200 400 desktop. The $1949 price buys you a network-ready computer that's easy to service and comes with built-in remote management hardware.

On the other hand, performance isn't the E-3200 400's strong suit. Despite this Windows NT 4.0–equipped PC's speedy PII-400 processor and 64MB of RAM, its PC WorldBench 98 score of 224 falls well short of the performance of other PII-400 systems running Windows NT. In fact, the E-3200 400 generated test scores that were about 6 percent lower than those of the average PII-400 running Win NT—closer to scores we've seen from machines powered by a PII–350 processor.

Gateway E-3200 400

But where the E-3200 400 slips in performance, it compensates with its smart remote management features and ▶

clever modular design. Its motherboard supports DMI 2.0, and it comes with Intel's LANDesk Client Manager software, which allows IS personnel to monitor the PC remotely from their desks. Powerful management tools like these make the E-3200 400 a good fit for small companies that want more control over their PC fleet as well as for large businesses looking to outfit an entire division.

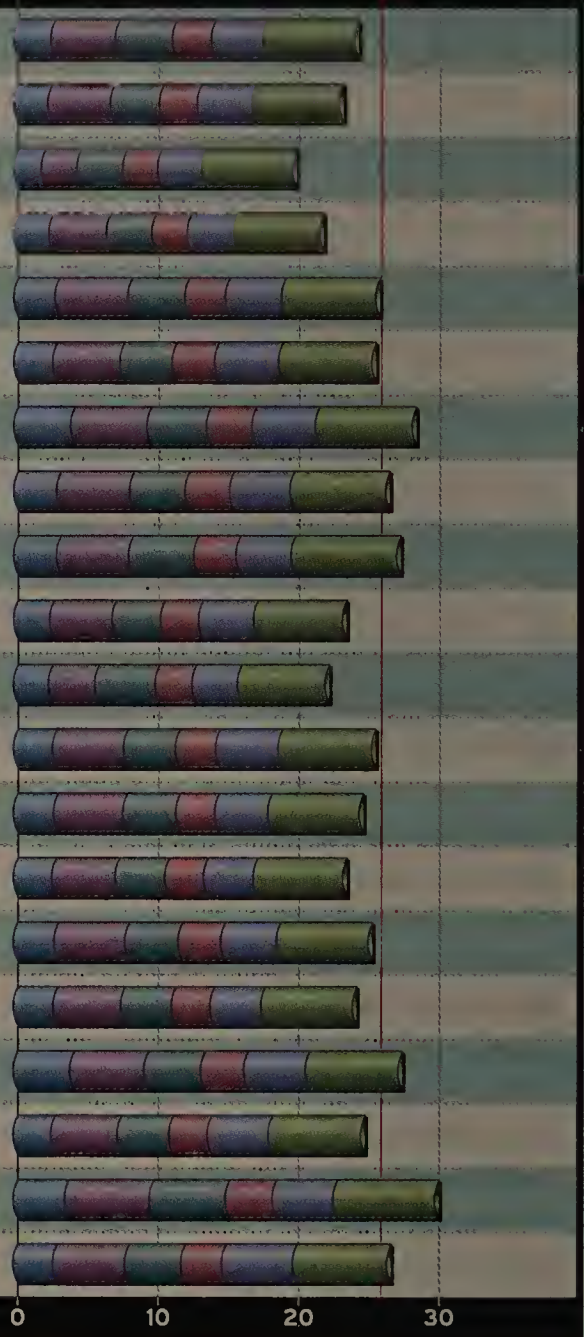
In addition, the E-3200 400's design makes it one of the easiest systems to service: Normally tedious tasks that involve removing the case cover and exchanging a component (whether it's the system memory or the processor) require very little time and very few tools. You get unimpeded access to the memory and expansion slots, and you can even detach and take out the E-3200 400's entire motherboard in about 30 seconds. But best of all, putting all the pieces back together is just as painless as taking them apart. Color-coded cables for the keyboard, mouse, and monitor help make the system a cinch to set up.

The E-3200's components are not state of the art, but they'll get the work done for general business applications. The Crystal PnP sound chip and ATI 3D Rage Pro Turbo AGP video chip are integrated onto the motherboard, but you can install an additional 4MB of video memory if you need it. The 17-inch Gateway EV700 monitor we evaluated offered only average display quality for images and text, but ▶

TOP 20 BUDGET DESKTOPS

TEST REPORT

	SYSTEM	CPU	Operating system	RAM (MB)	Secondary cache (KB)	PC World-Bench 98 score
1	Micro Express MicroFlex-35A*	AMD K6-2-350	Win 98	64	1024	179
2	Dell Dimension XPS R350*	Pentium II-350	Win 98	64	512	188
3	Gateway E-3200 400*	Pentium II-400	Win NT 4.0	64	512	224
4	Micro Express MicroFlex B2400B*	Pentium II-400	Win 98	128	512	201
5	NEC Direction SP E333*	Pentium II-333	Win 95	64	512	169
6	Dell Dimension V333c	Celeron-333	Win 98	64	128	170
7	CyberMax Entrepreneur PII-300	Pentium II-300	Win 95	64	512	152
8	Quantex QP6/333 SM-3x	Pentium II-333	Win 95	64	512	164
9	CyberMax Entrepreneur MII-300	Cyrix M II-300	Win 95	64	512	161
10	MidWest Micro Office Pro 350	Pentium II-350	Win 98	64	512	186
11	Quantex QP6/400 SM-3x	Pentium II-400	Win 95	64	512	198
12	Unicent Avanta E333	Celeron-333	Win 98	64	128	171
13	Acma NPower 6333	Pentium II-333	Win 95	64	512	177
14	Quantex QP6/350 M-4x	Pentium II-350	Win 95	64	512	186
15	CyberMax Entrepreneur PII-333	Pentium II-333	Win 95	128	512	171
16	NextPC N6-350 PII 350	Pentium II-350	Win 95	64	512	181
17	Unicent Avanta L333	Pentium II-333	Win 95	64	512	158
18	Compaq Deskpro EP C333	Celeron-333	Win 98	64	128	176
19	Polywell Poly K6266Mx	AMD K6-266	Win 95	64	512	145
20	HP Brio 7100	Celeron-300A	Win 98	64	128	163



*Best Buy

Word 97 | Word Pro 97 | Excel 97 | 1-2-3 97 | Paradox 8.0 | Picture Publisher 7.0

TEST PC WORLD CENTER

HOW WE TEST All systems are tested with PC World8ench 98, *PC World*'s application-based benchmark. A higher PC World8ench score is better. All PCs are tested with Windows 95, Windows 98, or Windows NT 4.0, and video resolution is set to 800 by 600 in 65,536 colors. We run automated scripts on six popular business applications, performing common tasks such as spelling checks, scrolls, saves, sorts, and recalculations. The PC World8ench 98 score is a sum of the weighted, normalized result of each script: Word 97 (10 percent), Word Pro 97 (10 percent), Excel 97 (20 percent), 1-2-3 97 (20 percent), Paradox 8.0 (20 percent), and Picture Publisher 7.0 (20 percent). For more details on our benchmark and how we run it, see PC World Online (www.pcworld.com/testing). [1]Under Windows 95.

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adjustments were easy enough to make. A flywheel control lets you change on-screen settings with the turn of a knob. Our E-3200 400 also came with a pair of unexceptional Altec Lansing GCS100 speakers, but multimedia isn't a priority for this PC. If you must have better speakers, for $30 more you can get the superior Boston Acoustics BA635 sound system.

On a more troubling note, the desktop design of the E-3200 severely limits its upgradability. The unit we evaluated came with CD-ROM and floppy drives, but it had no open bays for removable storage like an Iomega Zip drive. You could substitute the CD-ROM drive with a Zip drive, but doing so would make CD-based software installations impossible—a serious limitation.

MicroFlex B2400B

The system is backed by a generous three-year parts and labor warranty, and you get 24-hour tech support every day of the week. In surveys, our readers report the reliability of Gateway systems as good. But Gateway gets only fair marks from readers for the quality of its service. In our anonymous calls to Gateway's support line, technicians gave us adequate answers to our questions, but we had to wait on hold for about 8 minutes before we got to speak to a live person.

4 MICRO EXPRESS MICROFLEX B2400B

PRO: Inexpensive PII-400 machine, long warranty, a 2X DVD-ROM drive

CON: Comes with unremarkable software bundle, software MPEG decoder in lieu of MPEG-2 card

Moving up two notches this month into the Best Buy region is the second least expensive PII-400 system we've seen to date: the $1599 MicroFlex B2400B. This machine is about as bargain-priced as they come—about $650 less than the average PII-400 machine we've reviewed. In addition, the low price doesn't come at the expense of performance; the B2400B's PC WorldBench 98 score of 201 is on par with that of a typical system in its class.

The B2400B has solid, name-brand components where they count: A Creative Labs Sound Blaster AWE64 audio card and an ATI Xpert@Play AGP video card provide better-than-average sound and graphics for business applications and multimedia. But Micro Express also cut a few corners on the hardware to keep the price down. The second-generation DVD-ROM drive, for example, includes only a software MPEG decoder, not an MPEG-2 card. Without the hardware decoder, playing DVD video severely taxes the system's CPU. If you play a lot of music or sound clips through your PC, you'll also want to invest in better speakers; the Mli-828 sound system produced muddy bass and tinny treble.

When it comes to software, the MicroFlex we evaluated left us wanting more. The unremarkable bundle consists of Zoran's SoftDVD player and some shovelware communications utilities. Micro Express offers Office 97 Professional for $189 (but not the less expensive Small Business Edition) when you order your PC. In the end, the price of this system doesn't reflect the additional cost of buying business software, which many other models include.

Micro Express provides a long warranty (four years on parts and labor), 24-hour phone support, and free on-site service for a year. In our anonymous calls to tech support, we found the quality of the company's help to be improving over recent months. Our only gripe: One rep sounded as if he were falling asleep on the job.

5 NEC DIRECTION SP E333

PRO: Top system reliability scores according to readers, $149 price cut

CON: Integrated graphics chip is limiting, audio is a bit disappointing

NEC's Direction line has impressed us since its launch last year, delivering strong performance, user-friendly designs, and low prices to home and corporate buyers alike. With a $149 price cut—bringing the cost of the system down to $1599—the Direction SP E333 maintains its position on the chart. It's a good all-around PC with a moderate price and fairly good speed.

This month, NEC has made changes to the system's motherboard. The original Direction SP E333 we tested came with a Diamond Viper V330 AGP graphics card, but NEC recently switched to an integrated ATI Rage Pro Turbo AGP chip. Because you can't have two AGP devices in a computer, this modification means you'll no longer have the option of upgrading to a newer AGP card down the road (though you can still upgrade to a PCI-based video card).

As part of the motherboard change (and to keep the overall system cost down), NEC also integrated a Yamaha OPL3-Sax audio chip into the system. Although the Yamaha chip is perfectly acceptable for normal use in business presentations, it doesn't offer the advanced features available with add-on cards, such as positional 3D sound or a software wavetable.

Thankfully, when the company modified the system's configuration, one of the things it didn't change is the bundled monitor. We have no complaints about NEC's 17-inch C700 monitor. We found its images crisp, and the front-panel controls are easy to use—once you get used to them.

NEC Direction SP E333

The SP E333 reflects the same careful attention to detail found in other Direction PCs, including color-coded rear ports and an easy-open case. NEC backs this line with a three-year warranty on parts and labor, plus 24-hour support. In our anonymous calls, we had no trouble getting answers to our questions, but the time it took us to get through varied. Overall, however, NEC's support quality is good. Surveyed *PC World* readers rate the reliability of NEC systems as outstanding. ▶

BEYOND THE TOP 20

online

We evaluated the following systems along with the others, but they didn't score high enough to reach the *Top 20 Budget Desktops* chart. For write-ups, see PC World Online (www.pcworld.com/t20pcs).

- **PowerSpec PS-5432**
- **Polywell K6-2-350GX**

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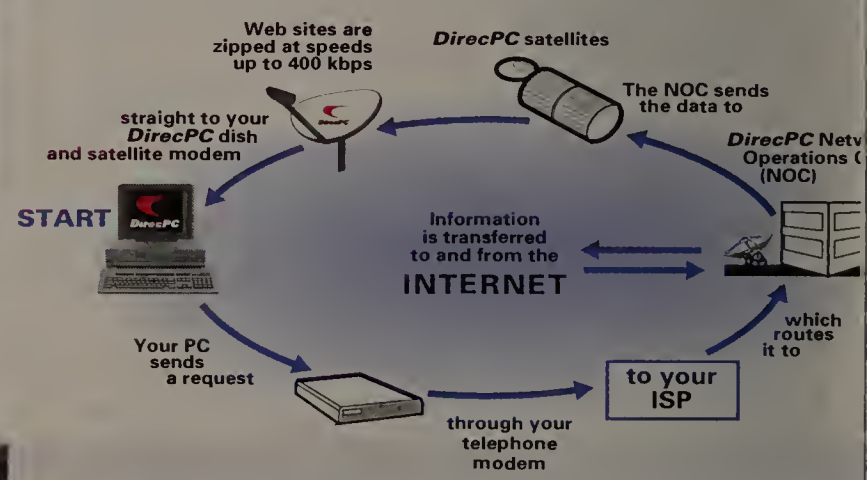

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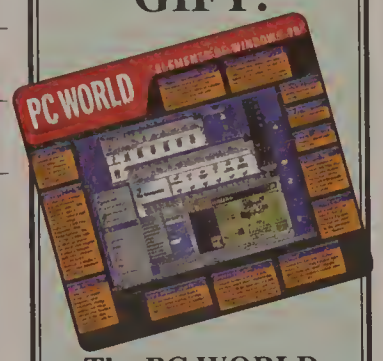

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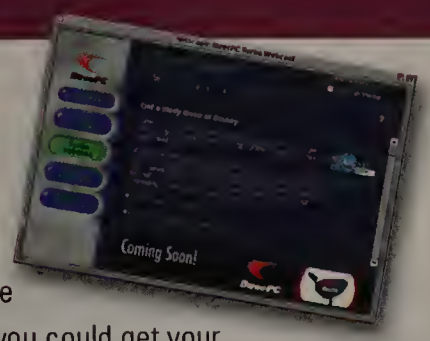

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e of Service Plan (Without ISP)	$19.99/Month	$34.99/Month	$109.99/Month
urs of Service (Availability)	24 Hours a Day	24 Hours a Day	24 Hours a Day
-Line Time (Hours of usage for Turbo Internet)	25 Hours /Month	100 Hours/Month	200 Hours/Month
dditional Hourly Rate (Including ISP) onal Hourly Rate (Without ISP)	$1.99/Hour $.99/Hour	$1.99/Hour $.99/Hour	$1.99/Hour $.99/Hour
irecPC Services			
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rbo Newscast: Broadcast delivery of up to 000 Usenet Newsgroups to your PC's hard drive	Included	Included	Included
Internet: Fully interactive access to the et at speeds up to 400Kbps	Included in Online Time	Included in Online Time	Included in Online Time
ee E mail Accounts	1	4	4
etworking (Number of Seats)	N/A	N/A	4

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PC WORLD

TOP 10 NOTEBOOK PCs

	POWER NOTEBOOK	Last month	Month tested	Street price (9/18/98)	CPU	Comments
1	Dell Latitude CPi D300XT 800/388-8542 www.dell.com	1	Nov 98	$3499	Pentium II-300	Thin laptop with latest Intel mobile CPU is Best Buy for second straight month.
2	Gateway Solo 2500LS 800/846-2000 www.gateway.com	n/a	Nov 98	$3199	Pentium II-300	Notebook with fixed CD-ROM and floppy drives has strong battery.
3	Dell Inspiron 7000 D300GT 800/388-8542 www.dell.com	2	Nov 98	$3599	Pentium II-300	Fastest notebook we've tested makes ideal desktop alternative.
4	Gateway Solo 9100LS 800/846-2000 www.gateway.com	4	Sept 98	$3099	Pentium II-266	$165 price cut on multimedia notebook with huge 14.1-inch screen.
5	Toshiba Tecra 8000 800/867-4422 www.computers.toshiba.com	5	Nov 98	$3499	Pentium II-266	Durable magnesium case and many optional upgrades extend its life span.
	BUDGET NOTEBOOK					
1	Gateway Solo 2500SE 800/846-2000 www.gateway.com	1	Sept 98	$1999	Pentium II-233	Fast, light laptop with built-in CD-ROM and floppy drives stays on top.
2	Quantex H-1331 800/896-4898 www.quantex.com	4	May 98	$1999	Pentium MMX-266	$500 off notebook with monster battery life and good performance.
3	Chem USA ChemBook 5033 510/608-8818 www.chemusa.com	3	Nov 98	$1479	AMD K6-300	Pentium alternative gives PMMX-266-level performance for hundreds less.
4	WinBook XL 233 DSTN [5] 800/965-9349 www.winbook.com	5	Oct 98	$1483	Pentium MMX-233	Bargain-priced portable has small hard drive and dual-scan screen.
5	Micro Express NP14A 800/989-9900 www.microexpress.net	n/a	Nov 98	$2399	Pentium II-266	Great price on quick PII-266 notebook that can replace your desktop.

Best Buy See features chart, page 228.

n/a = not applicable

[1] Includes computer; adapter; power cord; and floppy, DVD-ROM, or CD-ROM drive.

[2] For more about products here, select the number on the product information card or visit www.pcworld.com/infonet.

[3] Insufficient data to give a rating.

UNTIL RECENTLY, the multipurpose bay in notebooks has been something of a misnomer. Most of these bays allowed you to switch between a floppy drive and a CD-ROM drive, and a few let you add a spare battery. But if you wanted to upgrade to a DVD-ROM or Zip drive, for instance, you had to connect the device externally with a cable—or purchase a new notebook.

The latest notebooks address this problem by supplying a true multipurpose bay. The new bay lets you plug in a parade of other peripherals (including a second hard disk, DVD-ROM drive, or Zip or LS-120 backup drive) usually in the bay already shared by the CD-ROM and floppy drives. Imagine replacing your LS-120 drive with your extra hard drive for a big midweek presentation, and then tossing the hard drive into your luggage and plugging in the DVD-ROM drive so you can watch a movie during your Friday flight home. Hello, *Lethal Weapon 4*!

But you won't find a multipurpose bay in anything slower than a Pentium II-233 laptop; many are debuting in the new PII-300 notebook PCs. And as you might expect, this kind of flexibility doesn't come cheap. Each available option costs extra, ratcheting up the price on (typically) an already-expensive notebook. For instance, adding a 2X DVD-ROM drive to the $3499 Toshiba Tecra 8000, the only notebook on our chart with a multipurpose bay, pumps up the price by $399. A second 4GB hard drive costs $579 on the Tecra, and an extra battery is $269.

THE WAITING BLUES

DIRECT-SALES VENDORS boast that, by not warehousing notebooks, they can save you money. You order it; they build it. But the catch is that vendors sometimes take weeks or months to put the notebook together, making you languish with an "It's in the mail" promise. Though most direct-sales companies have occasionally been guilty of delays, some vendors do better than others at delivering on time.

We recently received a batch of letters from steamed consumers who complained that their H-series Quantex portables took over a month to arrive. According to a company representative, the delay stemmed from a massive back order on the unexpectedly popular new T-series, but the problem has been corrected. "Under normal circumstances, customers should have to wait only one to two weeks," said Quantex spokesperson Jessica Porchetta.

Corporations can avoid unexpectedly long waits by playing the field, notes analyst Kevin Knox of the Gartner Group, an industry research firm. "Standardize on two or three vendors; you lose some of your negotiating leverage when you're single-sourcing," he says.

PC World has a few tips for consumers, too. First, plan ahead: Even if a company

SCORECARD

★ Overall rating	PC WorldBench 98 score/performance	Price	Vendor's system reliability	Features and design	Vendor's support quality/policies	Battery life (hours:min)/rating	Traveling weight [1]	InfoNet number [2]
89	159/outstanding	average	good	very good	good/good	3:05/good	average	631
88	158/outstanding	average	good	very good	good/fair	4:09/very good	average	632
87	162/outstanding	average	good	very good	good/fair	3:37/good	very heavy	633
85	148/very good	average	good	outstanding	good/fair	3:25/good	very heavy	634
85	154/very good	average	good	good	good/fair	2:42/satisfactory	light	635
Power scorecard weightings ▶	Performance 22 percent	Price 14 percent	Reliability 22 percent	Features 16 percent	Support 10 percent	Battery life 8 percent	Weight 8 percent	
85	125/good	average	good	good	good/fair	3:15/good	light	636
84	119/good	average	[3]	very good	fair [4]/good	5:53/outstanding	average	637
82	117/good	very inexpensive	[3]	good	fair [4]/poor	2:28/satisfactory	average	638
79	109/satisfactory	very inexpensive	fair	satisfactory	good/poor	1:33/poor	heavy	639
79	149/outstanding	expensive	[3]	outstanding	fair [4]/fair	2:49/satisfactory	heavy	640
Budget scorecard weightings ▶	Performance 14 percent	Price 22 percent	Reliability 22 percent	Features 16 percent	Support 10 percent	Battery life 8 percent	Weight 8 percent	All products: 903

[4] Scores were derived from anonymous support-quality calls due to insufficient data from survey.

[5] Available via Web site only.

promises to deliver your notebook within a week, be prepared to wait at least a month. Second, ask for the name and phone number of your sales representative so you'll know whom to call back if necessary. Finally, remember the smart PC buyer's mantra: Pay with a credit card. That way, if delays or other problems emerge, you can stop payment.

DELL STILL THE BEST POWER BUY

LAST MONTH, IT WAS RAINING new notebooks on our charts, including the first Pentium II-300s to arrive at the PC World Test Center. In contrast, none of the six new portables we tested this month—notably Pentium II-300s from AST, Micron, Quantex, and NEC—scored high enough to make the elite list. Dell's $3499 Latitude CPi D300XT, a sleek PII-300 powerhouse, remains our preferred choice among power notebooks. The $1999 Gateway Solo 2500SE, the top performer on the budget side last month, remains in the Best Buy slot.

This Month's Best Buys

POWER NOTEBOOKS

1 DELL LATITUDE CPI D300XT

PRO: Very fast; excellent keyboard

CON: No modem even at this price

Dell's corporate-targeted Latitude CPi D300XT hangs on to the number-one spot on our power chart for a second month, despite its immobile price. The reasons: It's a pleasure to use; and with a PC WorldBench 98 score of 159, it's second in speed only to the third-place Dell Inspiron 7000 D300GT, which costs $100 more.

Like its predecessor—the nearly identical Latitude CPi D266XT—the D300XT has pleasing charcoal-gray looks. It's only 1.75 inches thick (2 inches is currently the notebook standard), and has one modular bay on the side. Weighing in at 7.4 pounds and supporting about 3 hours of battery life, the notebook is more than adequate away from the wall socket. You can increase its useful travel life by buying the optional second battery for $169 and using two batteries at once.

Dell's CPi D300XT has a great keyboard.

The Latitude CPi D300XT comes with an excellent keyboard: All the keys are of adequate size, have crisp action, and occupy the expected places. Switching from your desktop system's keyboard to the D300XT's should take no time at all. The touchpad is responsive and accurate. And you shouldn't have to worry about upgrading the hard drive for a while: The unit's 6.4GB of storage is less than 2GB shy of the largest notebook hard drive available today.

The CPi D300XT's brilliant screen produces a sharp image from edge to edge. The basic stereo that comes with the system yields tinny sound, but MIDI music plays better thanks to the software wavetable synthesizer. ▶

PHOTOGRAPHS: KEN SMITH

TOP 10 NOTEBOOK PCs — STANDARD FEATURES

	POWER NOTEBOOK	CPU	Traveling weight (pounds)[1]	RAM (MB)	Hard drive (GB)	Color screen type	Screen diagonal (inches)	Screen resolution	Maximum screen colors	Battery type	Pointing device
1	Dell Latitude CPi D300XT *	Pentium II-300	7.4	64	6.4	active	13.3	1024 x 768	262,144	lithium ion	touchpad
2	Gateway Solo 2500LS	Pentium II-300	8.3	64	4	active	13.3	1024 x 768	65,536	lithium ion	touchpad
3	Dell Inspiron 7000 D300GT	Pentium II-300	9.7	64	8	active	14.1	1024 x 768	16.8 million	lithium ion	touchpad
4	Gateway Solo 9100LS	Pentium II-266	9.6	64	6	active	14.1	1024 x 768	16.8 million	lithium ion	touchpad
5	Toshiba Tecra 8000	Pentium II-266	7.2	64	6.1	active	13.3	1024 x 768	262,144	lithium ion	eraserhead
	BUDGET NOTEBOOK										
1	Gateway Solo 2500SE*	Pentium II-233	7.1	32	2.1	active	12.1	800 x 600	262,144	lithium ion	touchpad
2	Quantex H-1331	Pentium MMX-266	7.4	64	4	active	13.3	1024 x 768	65,536	lithium ion	touchpad
3	Chem USA ChemBook 5033	AMD K6-300	8.1	32	4	active	12.1	800 x 600	16.8 million	NiMH	touchpad
4	WinBook XL 233 DSTN	Pentium MMX-233	8.7	32	1.6	dual-scan	12.1	800 x 600	262,144	NiMH	touchpad
5	Micro Express NP14A	Pentium II-266	9.2	64	3	active	14.1	1024 x 768	16.8 million	lithium ion	touchpad

*Best Buy ● Yes ○ No

[1] Includes computer; adapter; power cord; and floppy, DVD-ROM, or CD-ROM drive.
[2] Downloads only, uploads at 33.6 kbps; uses 3Com/U.S. Robotics' x2 technology.
[3] Downloads only, uploads at 33.6 kbps; uses Rockwell-Lucent's K56flex technology.
[4] Only one year on battery.

Dell generally gets high service and reliability marks from *PC World* readers. In our anonymous calls to Dell's technical support line, we were impressed with the reps' accuracy in recommending fixes but were disappointed with the average hold time of about 20 minutes.

BUDGET NOTEBOOKS

1 GATEWAY SOLO 2500SE

PRO: Inexpensive for a PII-233 system, light

CON: Poor speaker placement, flimsy keyboard

The Gateway Solo 2500SE wins the top spot on our budget chart for the second month. It's the least expensive Pentium II-233 notebook we've seen, with features and performance comparable to those of notebooks that are priced hundreds of dollars higher.

This gray, boxy portable is particularly well suited to the road. At 7.1 pounds, it's among the lightest Pentium II laptops we've tested, about half a pound less than the average laptop. The notebook's 3.3-hour battery life is average for a Pentium II.

Back at the office, you can connect the Solo 2500SE—even while it's still running—to a docking station for use on your desk. For backup and storage, the floppy drive bay also accepts an optional $125 120MB SuperDisk drive, which can read and write to standard 3.5-inch floppies. The CD-ROM drive is fixed.

The Solo 2500SE is easy and comfortable to use. It comes with a vibrant active-matrix screen and a Logitech touchpad that incorporates an unusual feature: You can simulate left and right mouse clicks by tapping on the touchpad with one or two fingers, respectively.

Gateway's Solo 2500SE: a lightweight traveler.

The Solo 2500SE's keyboard is run-of-the-mill. Typists who tend to pound on the keys will notice excessive flex under the keyboard. In addition, the speakers are located in the wrist rest, so your hands will tend to muffle the sound.

Beyond the Top 10

None of the following six new notebook computers scored high enough to make it to our *Top 10 Notebook PCs* chart this month, though several products came close.

AMONG POWER NEWCOMERS, NEC's $3899 Versa SX, built around a Pentium II-300 processor, came closest to making this month's chart. NEC is the pioneer of the true multipurpose bay. When we reviewed the Versa SX in late September, it accepted more add-ons—including an LS-120 backup drive, a Zip or DVD-ROM drive, an extra hard disk, or an extra battery—than any other portable we'd seen.

The Versa SX's thin 1.4-inch case and lightweight body are ideal for travel. Stripped down to its plastic weight-saver module, the notebook tips the scale at only 4.8 pounds. However, with a scant 90 minutes of battery life, this portable dies on the road faster than a suicidal armadillo. The Versa SX scores some points for a nice keyboard, but considering its high price tag and other drawbacks (including terrible audio quality and a mushy silver polycarbonate case), you may want to wait and see what the competition has to offer in a multipurpose-bay notebook before you make your decision.

SEPARATED AT BIRTH

THIS MONTH'S BATCH of new arrivals included two very similar laptops: Quantex's $2799 T-1410 (a PII-300) and Sceptre's $2500 SoundX S7000 (a PII-266). These two slim black portables look identical, from the nicely laid-out keyboard to the status lights located conveniently on the lid. Both notebooks have a modest

		EXPANDABILITY					CUSTOMER SUPPORT			
CD/DVD-ROM drive speed	Modem speed (kbps)	Maximum RAM (MB)	Modular expansion bays	Bay for second battery	Optional docking station	Infrared port	Warranty for parts/labor (years)	Weekday toll-free support (hours)	Weekend support	Online support
12X-24X	not included	128	1	●	●	●	3/1	24	Sat., Sun.	BBS, WWW
8X-20X	56 [2]	128	0	○	●	●	1/1	24	Sat., Sun.	AOL, BBS, CIS, WWW
2X DVD	56 [3]	192	1	●	○	●	3/3	24	Sat., Sun.	BBS, WWW
8X-20X	56 [2]	192	1	○	●	●	1/1	24	Sat., Sun.	AOL, BBS, CIS, WWW
12X-24X	56 [3]	256	1	○	●	●	3 [4]/3	24	Sat., Sun.	BBS, CIS, WWW
8X-20X	not included	160	0	○	●	●	1/1	24	Sat., Sun.	AOL, BBS, CIS, WWW
12X-24X	56 [3]	144	1	●	○ [5]	●	varies [6]/1	24	Sat., Sun.	BBS, WWW
8X-20X	56 [2]	96	0	○	○	●	1/3	9	none	WWW
8X-20X	56 [3]	128	0	○	○	●	1/1	13	Sat.	BBS, WWW
10X-24X	56 [3]	256	2	○	●	●	4/4	24	Sat., Sun.	WWW

[5] Comes standard with a port replicator.
[6] Three years on CPU and main RAM, one year on other parts.

heft of about 7.4 pounds and run for at least 2 hours on one battery charge. With its side-mounted speakers in place, either could stand in for a portable CD player. The SoundX S7000's 13.3-inch screen and 4GB hard drive are slightly smaller than the T-1410's. Also, the SoundX comes without software and is a bit slower than the T-1410. Otherwise, though, you get the same notebook for $299 less.

If full-motion, full-screen video is on your wish list, check out AST's $2999 Ascentia M6000, a desktop alternative aimed at small and midsize businesses. Available only through value-added resellers, the M6000 is one of the first AGP-equipped notebooks we've seen, and the technology seems to make a difference. Based on a demo we saw, the PII-300 Ascentia M6000 plays DVD movies and 3D games better and faster than older non-AGP laptops such as PMMX models.

AST's version of a multipurpose bay sits in front and accepts a DVD-ROM or Zip drive (both of which cost extra), in addition to the CD-ROM or floppy drive. But in our tests, when we left the notebook on all day, the drive bay connector died.

The notebook also has a dedicated external connection for the floppy drive, so you can keep your parallel port free for your printer. The keyboard feels fine, and the teal lettering stands out nicely on the function keys. Just be prepared to wrestle with the battery cover when you want to swap batteries: The only help you get is a molded fingerhold. A bigger factor in keeping the M6000 off the chart, however, is the poor reliability of AST notebooks, according to our readers.

MICRON'S WORK-IN-PROGRESS

THE $2999 TRANSPORT TREK 2 suffers from growing pains. This 8.4-pound desktop replacement from Micron retains vestiges of abandoned design ideas and promises of new ones to come. Why, for instance, the sliding window that lets you peek at the battery? Answer: It's a relic from an earlier design phase, when Micron planned to install an internal AC adapter.

More importantly, why does the Trek 2 come with CD-ROM and floppy disk drives that can be removed from their separate modular bays even though only one other option, a 4GB hard drive, is available? Well, that's because the Trek 2 is intended as the precursor to Micron's first multipurpose-bay notebook. Expect to see a DVD-ROM drive and other swappable options in the future.

In the meantime, the Trek 2 is somewhat overpriced for a notebook equipped with a 3GB hard drive, 64MB of RAM, a 14.1-inch screen, a 56-kilobits-per-second PC Card modem, and a blink-and-you'll-miss-it battery life of 1 hour.

DESKTOP CHIP IN A NOTEBOOK

THE SOLE new entry-level notebook we tested, Umax's ActionBook 330T, turned in extremely disappointing speed scores. The $1849 330T is one of the first notebooks based on AMD's K6-2-300 desktop chip, which challenges Intel's PII-300 CPU. Unfortunately, in our tests the 330T performed only about as well as the average PII-233 notebook. Still, this boxy, black, 8-pound notebook is several hundred dollars cheaper than some PII-233s, and it might make a good machine for a commuter on a budget.

The downsides? The 4GB hard drive isn't upgradable, and the battery—an older nickel–metal hydride type—lasted only 90 minutes in our tests. But our biggest concern involves Umax's support quality. This company's relative newness to the notebook market shows most starkly in the mistakes of its staff. Reps mishandled every question we asked in our latest round of anonymous calls.

PC World *Contributing Editor Carla Thornton specializes in notebooks and mobility products.* ■

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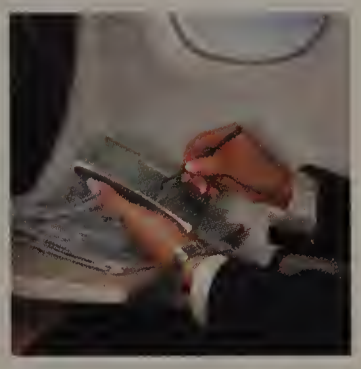

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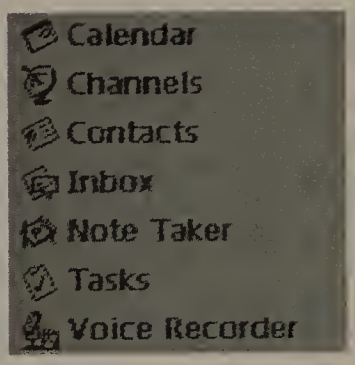

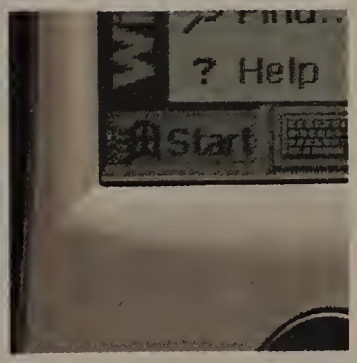

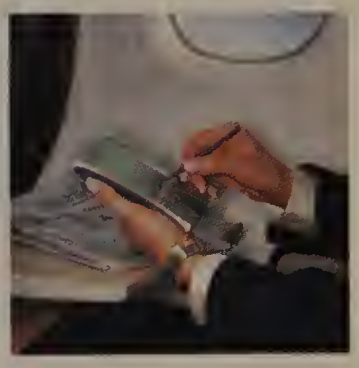

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TOP 10 PRINTERS

	SMALL-BUSINESS/HOME PRINTER[1]	Street price (9/1/98)	Overall rating	Speed for plain text (ppm)	Speed for full-page graphics (ppm)	Comments	InfoNet number
1	HP DeskJet 722C 800/752-0900 www.hp.com	$299	84	4.1	0.3	**FEATURES:** Ink jet, rated 5 ppm monochrome/1.5 ppm color. 600-by-600-dpi maximum resolution, 100 sheets input, 50 output. **SUMMARY:** Impressive speeds for an ink jet, good print quality, and a moderate price propel this Hewlett-Packard model to number one.	614
2	Epson Stylus Photo 700 800/463-7766 www.epson.com	$279	83	1.3	0.4	**FEATURES:** Ink jet, speed unrated. 1440-by-720-dpi maximum resolution, 100 sheets input, 30 output. **SUMMARY:** Good print quality on plain paper—and outstanding quality on specialty media—but text speed is particularly slow. Comes with a strong photo-oriented software bundle.	–
3	Canon BJC-5000 800/652-2666 www.ccsi.canon.com	$249	82	2.3	0.4	**FEATURES:** Ink jet, rated 7.5 ppm monochrome/3 ppm color. 1440-by-720-dpi maximum resolution, 130 sheets input and output. **SUMMARY:** Good print quality, a low price, and top-notch paper-handling options (it accepts sheets up to 11 by 17 inches, for example) balance below-average speeds.	615
4	Lexmark 5700 Color Jetprinter 800/539-6275 www.lexmark.com	$249	81	2.9	0.3	**FEATURES:** Ink jet, rated 8 ppm monochrome/4 ppm color. 1200-by-1200-dpi maximum resolution, 100 sheets input, 25 output. **SUMMARY:** Slightly faster than the Canon BJC-5000 but with less impressive print quality. Home users will especially like its bundled CD-ROM of software.	616
5	Lexmark 3200 Color Jetprinter 800/539-6275 www.lexmark.com	$179	80	2.1	0.4	**FEATURES:** Ink jet, rated 6 ppm monochrome/2.5 ppm color. 1200-by-1200-dpi maximum resolution, 100 sheets input, 25 output. **SUMMARY:** Solid print quality for a reasonable price, but performance is somewhat slow and the design could be sturdier. The 5700 Color Jetprinter offers more features.	617
6	Epson Stylus Color 1520 800/463-7766 www.epson.com	$799	80	3.3	1.2	**FEATURES:** Ink jet, rated 6 ppm monochrome/5 ppm color. 1440-by-720-dpi maximum resolution, 100 sheets input, 35 output. **SUMMARY:** Prints big—on sheets up to 13 by 19 inches—but you pay a hefty premium for the privilege. Also, print quality at default settings is only adequate.	–
7	Canon BJC-4400 800/652-2666 www.ccsi.canon.com	$179	80	2.1	0.4	**FEATURES:** Ink jet, rated 6.5 ppm monochrome/2.5 ppm color. 720-by-360-dpi maximum resolution, 100 sheets input and output. **SUMMARY:** Great price and small size, but middling print quality. Features aren't as strong as those on our Best Buy for home users, the Canon BJC-5000.	618
	CORPORATE PRINTER						
1	Lexmark Optra SC 1275 800/539-6275 www.lexmark.com	$2999	87	7.5	0.5	**FEATURES:** Laser, rated 12 ppm monochrome/3 ppm color. Standard 16MB of RAM, 600-by-600-dpi maximum resolutions, 400 sheets input, 250 output. **SUMMARY:** A great choice for busy offices, with high speeds, extensive paper-handling options, and a reasonable price.	619
2	Minolta Color PageWorks PS 888/264-6658 www.minoltaprinters.com	$3299	86	6.0	0.4	**FEATURES:** Laser, rated 12 ppm monochrome/3 ppm color laser. Standard 20MB of RAM, 600-by-600-dpi maximum resolutions, 400 sheets input, 250 output. **SUMMARY:** Impressive text quality and good paper-handling features help balance comparatively slow speed.	620
3	QMS Magicolor 2 CX 800/523-2696 www.qms.com	$3200	83	9.7	0.5	**FEATURES:** Laser, rated 16 ppm monochrome/4 ppm color. Standard 24MB of RAM, 2400-by-600-dpi color, 600-by-600-dpi monochrome maximum resolutions, 250 sheets input and output. **SUMMARY:** Excellent graphics quality, but documentation is weak and control-panel menus are hard to navigate.	621

Best Buy [1] All printers were retested this month, except the Lexmark 3200 Color Jetprinter, which is new. Recommended for home. Windows 95-certified Plug and Play All products: 901

TEST PC WORLD CENTER

HOW WE TEST The overall rating for color small-business/home and corporate printers is based on print quality (25 percent), price (25 percent), features (15 percent), speed (10 percent), service and support (10 percent), and ease of use (15 percent). For all ratings, higher is better. Data based on tests designed and conducted by the PC World Test Center. All rights reserved.

WE'VE REVAMPED OUR Top 10 charts, and this month, it's all about color. At the same time, we've divided the list into two sections—small-business/home and corporate—awarding Best Buys to the top small-business, home, and corporate printers. Only one new printer makes the list: Lexmark's 3200 Color Jetprinter, a cheap home ink jet. For more details, see this month's printer roundup, "All Color, All the Time" (page 160). ■

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3D WinBench '98†

VELOCITY 4400	1150
VIPER V550	1080
Graphics Blaster	1020
G-200	563

High End WinMark '98*†

VELOCITY 4400	298
VIPER V550	286
Graphics Blaster	279
Millennium G-200	273

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PC WORLD

TOP 10 MONITORS

	17-INCH MONITOR	Month tested	Street price (9/1/98)	Overall rating	Quality of text/graphics	Comments	InfoNet number
1	IBM P72 800/426-7255 ext. 4753 www.pc.ibm.com/us/accessories/monitor	Oct 98	$549	89	excellent/excellent	**FEATURES:** 15.7-inch viewable area, .25mm stripe pitch Trinitron tube, up to 85-Hz refresh rate,[1] Plug and Play ready,[2] TCO'95 compliant, three-year warranty, 24-hour toll-free support. **SUMMARY:** Still pricey after a $40 cut, but this jet-black monitor renders gorgeous colors and has a wide selection of on-screen controls.	–
2	Mitsubishi Diamond Pro 87TXM 800/843-2515 www.mitsubishi-display.com	Oct 98	$539	88	very good/very good	**FEATURES:** 15.7-inch viewable area, .25mm stripe pitch Diamondtron tube, up to 107-Hz refresh rate,[1] Plug and Play ready,[2] TCO'95 compliant, three-year warranty, 12-hour weekday toll-free support. **SUMMARY:** Longtime Best Buy maintains ranking with finely focused picture and elegant controls; somewhat expensive.	622
3	Samsung SyncMaster 700p plus 800/933-4110 www.sosimple.com	Oct 98	$449	88	very good/very good	**FEATURES:** 15.6-inch viewable area, .26mm dot pitch tube, up to 120-Hz refresh rate,[1] Plug and Play ready,[2] TCO'95 compliant, three-year warranty, 24-hour toll-free support. **SUMMARY:** Bright colors, increased refresh rate distinguish this handsome, well-priced model despite on-screen controls with cryptic icons.	623
4	AcerView 79g 800/369-6736 ext. 125 www.acerperipherals.com	Oct 98	$429	86	very good/excellent	**FEATURES:** 15.5-inch viewable area, .25mm stripe pitch Diamondtron tube, up to 110-Hz refresh rate,[1] Plug and Play ready,[2] TCO'95 compliant, three-year warranty, 24-hour toll-free support. **SUMMARY:** $20 price cut and sharp, clean graphics make up for smallest viewable area here and crude on-screen controls.	624
5	Iiyama VisionMaster Pro 400 800/394-4335 www.iiyama.com	Oct 98	$499	86	very good/very good	**FEATURES:** 15.7-inch viewable area, .25mm stripe pitch Diamondtron tube, up to 115-Hz refresh rate,[1] Plug and Play ready,[2] TCO'95 compliant, three-year warranty, 12-hour weekday toll-free support. **SUMMARY:** Fine picture, new color-correction utilities; generic design; on-screen controls take some time to master.	625
6	ViewSonic PT775 800/888-8583 www.viewsonic.com	Oct 98	$649	86	very good/excellent	**FEATURES:** 15.9-inch viewable area, .25mm stripe pitch Diamondtron tube, up to 117-Hz refresh rate,[1] Plug and Play ready,[2] TCO'95 compliant, three-year warranty, 11-hour weekday toll-free support. **SUMMARY:** Stunning graphics and crisp text plus high refresh rate overcome a very steep price and short support hours.	626
7	Dell UltraScan 1000HS 800/289-3355 www.dell.com	Oct 98	$429	83	very good/excellent	**FEATURES:** 15.7-inch viewable area, .25mm stripe pitch Trinitron tube, up to 105-Hz refresh rate,[1] Plug and Play ready,[2] TCO'95 compliant, one-year warranty, 24-hour toll-free support. **SUMMARY:** Despite short warranty, huge $200 cut renews competitive edge. Warranty extends to three years if purchased with Dell system.	627
8	Apple MultipleScan 720 800/889-2629 www.apple.com	Oct 98	$449	83	good/good	**FEATURES:** 15.7-inch viewable area, .28mm dot pitch tube, up to 85-Hz refresh rate,[1] Plug and Play ready,[2] TCO'95 compliant, one-year warranty, 12-hour weekday toll-free support. **SUMMARY:** Easy-to-use controls and good documentation, but warranty is chintziest here, and image quality suffers from so-so graphics.	628
9	Mitsubishi DiamondScan 70M 800/843-2515 www.mitsubishi-display.com	Oct 98	$419	83	good/good/	**FEATURES:** 15.9-inch viewable area, .28mm dot pitch microfilter tube, up to 85-Hz refresh rate,[1] Plug and Play ready,[2] TCO'95 compliant, three-year warranty, 12-hour daily toll-free support. **SUMMARY:** Lowest-priced monitor here has compact integrated speakers, but image quality lags, and on-screen controls aren't intuitive.	629
10	Panasonic PanaFlat PF70 800/742-8086 www.panasonic.com/allve	Oct 98	$679	82	very good/excellent	**FEATURES:** 15.6-inch viewable screen, .24mm slot pitch tube, up to 106-Hz refresh rate,[1] Plug and Play ready,[2] TCO'92 compliant, three-year warranty, 24-hour toll-free support. **SUMMARY:** Colors look great, but text screens appear concave at first, and monitor has the highest price on the chart.	630

Best Buy For reviews of products that didn't make the chart, visit www.pcworld.com/t10monitors. All products: 902

TEST PC WORLD CENTER

HOW WE TEST Ten judges rate a monitor's text and graphics quality. We evaluate each unit on how well it displays typical business letters, a newsletter, spreadsheets, Web pages, and scanned images. The overall rating is based on text and graphics quality (25 percent each), features and ease of use (25 percent), price (20 percent), and service and support (5 percent). The best possible overall rating is 100. Data based on tests designed and conducted by the PC World Test Center. All rights reserved.

[1] Highest refresh rate at 1024 by 768 resolution. [2] Plug and Play monitors and graphics cards can communicate bidirectionally. However, Windows 95 does not fully utilize monitor Plug and Play.

WITH TERRIFIC TEXT and great graphics, our two Best Buys from IBM and Mitsubishi remain front-runners despite their higher-than-average prices. Dell's UltraScan 1000HS rejoins the chart after a brief hiatus, thanks to a huge $200 price drop—the largest we saw this month. New monitors from Hewlett-Packard, KDS, Optiquest, Philips, Princeton, and Sceptre Technologies fell short because of low image-quality scores. ■

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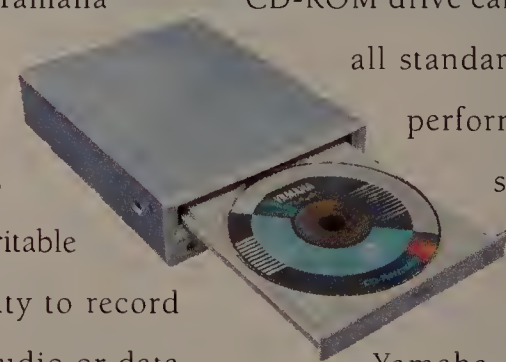

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PC WORLD

TOP 10 GRAPHICS BOARDS

	PCI BOARD	Month tested	Street price (10/8/98)	Overall rating	Mixed-media business rating	3D rating	Features rating	Comments	InfoNet number
1	Diamond Viper V550 800/468-5846 www.diamondmm.com	NEW	$200	83	good	excellent	good	**FEATURES:** 16MB of SDRAM; 250-MHz RAMDAC; NVidia RIVA TNT chip; bundled 3D games, graphics plug-ins, and tools for VRML authoring and photo editing. **SUMMARY:** Top-notch overall performance and generous software bundle override high price.	680
2	Real 3D StarFighter PCI 800/393-7730 www.real3d.com	Aug 98	$149	82	average	excellent	average	**FEATURES:** 24MB of SGRAM (includes 16MB dedicated texture RAM), 220-MHz RAMDAC, Intel740 chip, bundled 3D games and 3D modeling program. **SUMMARY:** $70 price drop and terrific 3D performance outweigh fair features and sparse support.	681
3	STB Velocity 128 800/234-4334 www.stb.com	Aug 98	$99	82	average	average	good	**FEATURES:** 4MB of SGRAM, 230-MHz RAMDAC, NVidia RIVA 128 chip, bundled 3D games and 3D modeling program. **SUMMARY:** A low-cost option for users who like to dabble in a little of everything. The 12Bzx AGP version is also a good buy.	682
4	Hercules Thriller 3D 800/532-0600 www.hercules.com	Aug 98	$99	78	average	excellent	below average	**FEATURES:** 4MB of SGRAM, 230-MHz RAMDAC, Rendition Verite V2200 chip, no bundled software. **SUMMARY:** Affordable, fast in 3D, and adequate for business use, but the board is short on features, and the company doesn't offer weekend support.	683
5	ATI Xpert@Play 98 905/882-2600 www.atitech.com	Sept 98	$95	78	good	below average	good	**FEATURES:** 8MB of SGRAM, 230-MHz RAMDAC, ATI 3D Rage Pro Turbo chip, bundled 3D games. **SUMMARY:** This board enters the chart for the first time thanks to a $35 price drop. It's a fine choice for home or office use and includes a TV-out port.	684
	AGP BOARD								
1	Matrox Millennium G200 800/361-1408 www.matrox.com/mga	Oct 98	$149	92	excellent	excellent	excellent	**FEATURES:** 8MB of SGRAM, 250-MHZ RAMDAC, MGA-G200 chip, bundled 3D modeling tool and image editing app. **SUMMARY:** Great speed and 3D image quality make this board a strong candidate for the office and for after-hours gaming.	685
2	STB Velocity 4400 800/234-4334 www.stb.com	NEW	$200	91	good	excellent	excellent	**FEATURES:** 16MB of SDRAM; 250-MHz RAMDAC; NVidia RIVA TNT chip; bundled 3D games, video editing tool, and graphics plug-ins. **SUMMARY:** Breakneck 3D speed makes this board a prime choice for 3D gaming and most graphics tasks.	686
3	STB GLyderMax-2 800/234-4334 www.stb.com	Oct 98	$99	91	excellent	good	good	**FEATURES:** 8MB of SGRAM, 230-MHz RAMDAC, 3Dlabs Permedia 2 chip, bundled 3D games and VRML creator. **SUMMARY:** The GLyderMax-2 is a good pick for the office. It does a nice job with business graphics apps and with 3D games.	687
4	Matrox Mystique G200 800/361-1408 www.matrox.com/mga	Nov 98	$149	88	excellent	good	excellent	**FEATURES:** 8MB of SDRAM, 230-MHz RAMDAC, MGA-G200 chip, bundled 3D games. **SUMMARY:** Excellent mixed-media graphics performance and extras like a TV-out port outbalance Matrox's short three-year warranty and lack of weekend support.	688
5	Hercules Terminator Beast 800/532-0600 www.hercules.com	NEW	$120	88	good	excellent	average	**FEATURES:** 8MB of SDRAM, 250-MHz RAMDAC, S3 Savage 3D chip, no bundled software. **SUMMARY:** With excellent 3D performance, the Terminator Beast makes a nice upgrade for gaming fanatics. However, it's short on features and support.	689

Best Buy For reviews of products that didn't make the chart, visit www.pcworld.com/t10graphics. All products: 906

TEST PC WORLD CENTER **HOW WE TEST** We test boards under Windows 95. Business tests include PC WorldBench 98, a PowerPoint test, and a Macromedia Director script. Our 3D score is based on four games, each evaluated on frame rate and image quality. For AGP cards we add a texturing test using Caligari's TrueSpace3. PCI boards were tested in a Micron Millennia Mme with a Pentium MMX-233 and 32MB of RAM. AGP boards were tested in an NEC Direction 333 with a PII-333 and 64MB of RAM. Overall rating is based on performance (PCI 50 percent, AGP 55 percent), features (25 percent), price (PCI 15 percent, AGP 10 percent), and support policies (10 percent). For all scores, higher is better. Data based on tests designed and conducted by the PC World Test Center. All rights reserved.

THREE NEW graphics cards crack this month's chart. Diamond's Viper V550 PCI board (replacing the V330 model) earns a Best Buy, thanks to strong all-around performance and a useful set of bundled software, including MGI Software's PhotoSuite SE. On the AGP side, STB's new Velocity 4400 comes in second, while the Matrox Millennium G200 maintains its Best Buy position. Hercules's Terminator Beast grabs fifth place for its fast 3D speed. ■

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Dell	[illegible]	[illegible]
IBM	[illegible]	[illegible]
Fair		
Gateway 2000	[illegible]	[illegible]
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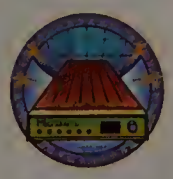
PC WORLD

TOP 10 MODEMS

	EXTERNAL MODEM	Month tested	Street price (9/28/98)	Overall rating	V.34 transfers/ 56-kbps downloads (min:sec per MB)	Comments	InfoNet number
1	Diamond Multimedia SupraExpress 56 800/468-5846 www.diamondmm.com	retested this month	$120	83	2:31/2:58	**FEATURES:** Supports V.9D and K56flex, V.80 videoconferencing, serial cable, FaxTalk Communicator software. **SUMMARY:** This V.90 version of the 56e is $9 less expensive than its K56flex-only predecessor, and was faster in both 33.6- and 56-kbps tests—all of which help push it to the top spot.	690
2	Zoom FaxModem 56Kx Dualmode 800/631-3116 www.zoomtel.com	Oct 98	$99	82	2:31/3:10	**FEATURES:** Supports V.90 and K56flex, MNP-10EC error control, D1 Communique Communicate software. **SUMMARY:** An excellent modem for home and business, the 56Kx is reasonably priced, performed well on V.34 transfers, and is backed by 14.5-hours-per-day technical support.	691
3	3Com U.S. Robotics 56K Faxmodem 800/342-5877 www.3com.com	June 98	$149	81	2:43/2:54	**FEATURES:** Supports V.90 and x2, distinctive ring, manual volume control, Caller ID, RapidComm software. **SUMMARY:** Great 56-kbps speed and a lifetime warranty keep this peppy external modem well up the chart. But it's the second most expensive external modem on the chart and has neither voice features nor toll-free support.	692
4	Shark Multimedia Leopard XT-56K 800/800-3321 www.sharkmm.com	retested this month	$100	81	2:35/3:08	**FEATURES:** Supports V.90 and K56flex, distinctive ring, voice mail, speakerphone, VoiceView, ASVD, DSVD, manual volume control, serial cable, Caller ID, DialTone software. **SUMMARY:** Replaces K56flex-only model featured on the October chart, and sells for $10 less. But it can't support V.9D and K56flex at the same time.	693
5	3Com U.S. Robotics Courier V.Everything 800/638-3266 www.3com.com	Oct 98	$271	80	2:24/2:58	**FEATURES:** Supports V.90 and x2, distinctive ring, manual volume control, password protection, callback security, QuickLink II fax/data software. **SUMMARY:** It's the priciest on the chart, but security features such as modem-level password protection and callback make it your best choice in a corporate modem.	694
6	Archtek SmartLink 5634TS 888/912-9800 www.archtek.com	Oct 98	$95	80	2:39/2:53	**FEATURES:** Supports V.90 and x2, MNP-10EC, V.80, distinctive ring, voice mail, speakerphone, VoiceView, ASVD, Caller ID, QuickLink Message Center software. **SUMMARY:** A price cut of $14 makes the fast, full-featured SmartLink the cheapest unit on the chart. Support hours are very short, however.	695
7	Boca Tidalwave 56K External Speakerphone Modem 561/241-8088 www.bocaresearch.com	Aug 98	$129	78	2:32/3:09	**FEATURES:** Supports V.90 and K56flex, V.8D videoconferencing, distinctive ring, speakerphone, voice mail, Caller ID, QuickLink Message Center software. **SUMMARY:** Boca's Tidalwave has plenty of features, but the price is a little on the high side, and the documentation could be easier to read.	696
	PC CARD MODEM						
1	3Com Megahertz 56K Cellular-Capable PC Card Modem 800/638-3266 www.3com.com	Oct 98	$199	82	2:27/2:51	**FEATURES:** Supports V.90 and x2, cellular connectivity, voice mail, speakerphone, Caller ID, digital line voltage protection, pop-out phone jack, RapidComm software. **SUMMARY:** Firmware upgrade improves model that ranked third on the PC Card chart in August. It now comes with V.90.	697
2	TDK Global Freedom 5660 800/999-4835 www.tdksystems.com	Aug 98	$199	80	2:34/3:10	**FEATURES:** Supports K56flex, MNP-10EC, distinctive ring, voice mail, Caller ID, digital line voltage protection, QuickLink Message Center software. **SUMMARY:** Rich features and speedy 33.6-kbps speed offset substandard support, which lacks cross-ship modem replacements. Also a good option is its CyberExpress 5600 sibling.	698
3	Viking 56K PC Card Modem 800/338-2361 www.vikingcomponents.com	NEW	$119	79	2:41/3:06	**FEATURES:** Supports V.9D and K56flex, MNP-10EC, QuickLink Mobile Software. **SUMMARY:** The remarkably affordable Viking 56K PC Card Modem is a good choice if price is your main concern, but it comes with few extras and lacks digital voltage protection. In addition, the manual is rather skimpy.	699

Best Buy For reviews of products that didn't make the chart, visit www.pcworld.com/t10modems. All products: 907

TEST PC WORLD CENTER **HOW WE TEST** We test V.34 (limited to 33.6 kbps) modem-to-modem performance using two identical modems on a Telecomm Analysis Systems simulated phone network. It sends a text file over 55 line conditions, and a mix of four files—graphics, text, program, and compressed files—over one line condition. For our x2 or K56flex tests, we call a local Internet service provider and transfer .jpg, .doc, and .zip files continuously for 18 hours. TAS transfers are faster than ISP downloads because files used in the latter are less compressible. Results for the two tests are not comparable. We currently do not test 56-kbps V.9D modem performance due to lack of ISP support. Data based on tests designed and conducted by the PC World Test Center. All rights reserved.



WE TESTED THE NEW V.90 versions of the Diamond MUltimedia SupraExpress 56 and Shark Multimedia Leopard XT-56K. Both performed as well or better than their K56flex-only forebears, and cost less. We also tested IBM and Viking PC Card modems this month, both named 56K PC Card Modem. Viking's model is the cheapest V.90 PC Card modem we've seen; IBM's unit missed the chart because of its high $225 price. ■

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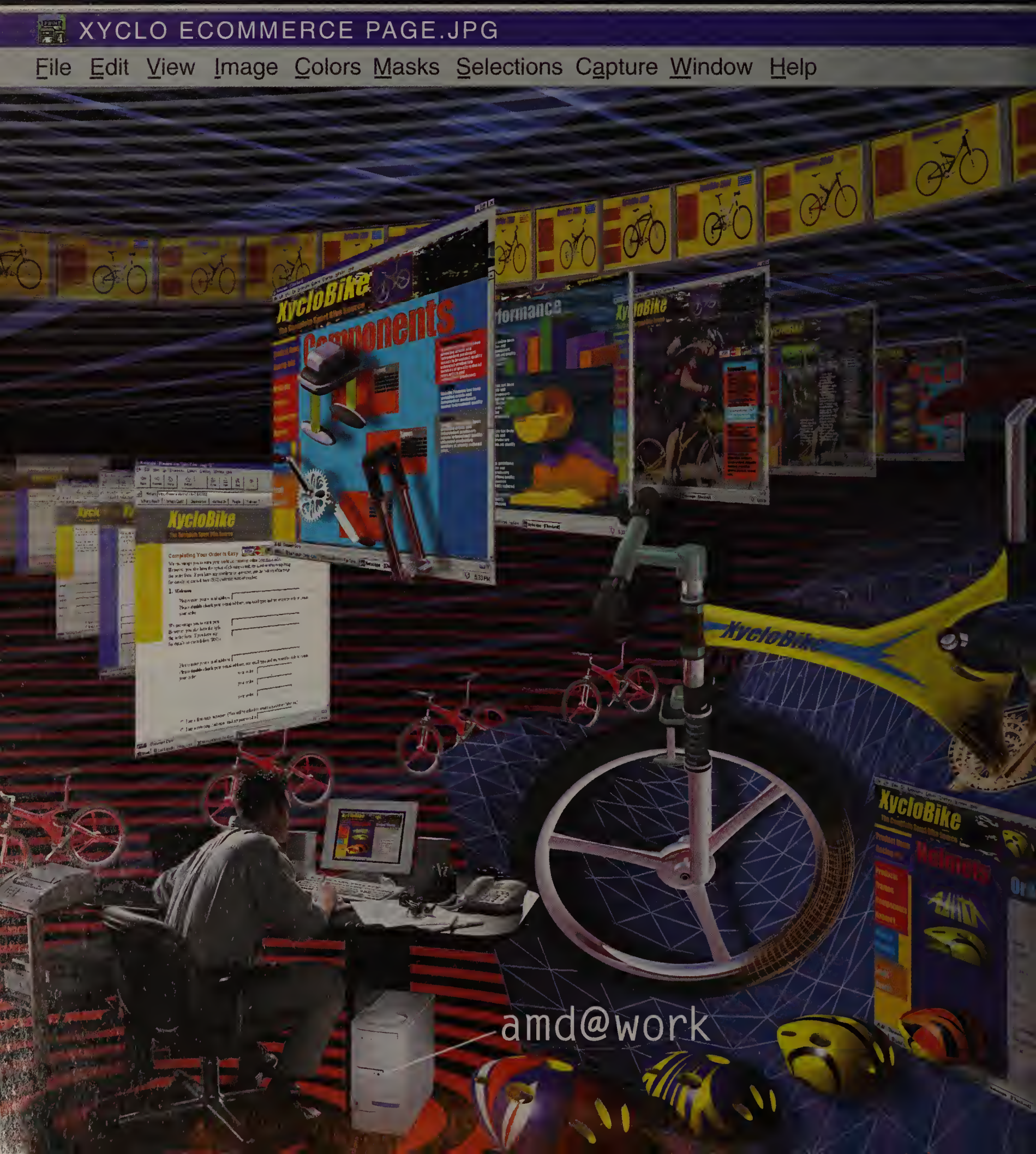
A three



dimensional one.

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PC WORLD @HOME

Top 10 Titles of 1998

These CD-ROMs and DVD-ROMs are the year's best games, references, and for-fun software.

◆ BY GREGG KEIZER

THERE ARE TWO KINDS OF PEOPLE: those who keep and those who toss. No question I belong to the second bunch. Nothing makes me feel better than to clean house by throwing things out.

Especially when it comes to software. Seems I'm on every software maker's mailing list—I know my FedEx and UPS drivers by their first names—so clearing shelves is a monthly chore around here. But I don't fling everything into the trash. A select few home titles that cross my threshold manage to escape the dumpster all year long.

Crammed into a small corner of my bookshelf are the ten games, creativity packages, and e-reference works that earned a spot on my A-list. These are the CD-ROMs and DVD-ROMs that even I can't bear to pitch. And they make perfect gifts for the geek who has everything.

KNOW IT ALL

HOMEWORK, schmomework. Browsing **Encarta Reference Suite 99** is too much fun to be called work. For just $100, you get a full complement of essential at-home e-references: Encarta Encyclopedia 99 Deluxe, the Virtual Globe 99 atlas, and Bookshelf 99, a collection that includes everything from a thesaurus and a dictionary to an almanac. Each of the three references offers enhancements or new features this year, the most prominent of which is Encarta's natural language query system. For example, I only had to type "Who invented the steam engine?" to get information about James Watt. The package's other additions include text-to-speech capabilities, and slick navigational tools in both Encarta and Virtual Globe. If your PC has the right drive, get the DVD-ROM version, which fits the three titles onto one disc. (Also, see our review this month in *New Products*, page 99.)

SHOW ME

I'VE MANAGED to dump film for digital photography, but until recently one thing still eluded me: how to show off my digital pics without boring everyone. I found the answer in **Kai's Power Show**, a program that assembles slide shows of digital images. It's so easy to use that even I put together a slick presentation. I yanked photos of a best friend's kids out of my digital camera, organized them to tell a short story, added transitions like dissolves and nifty vortexes, and then laid down several of the included sound effects and my own voice-over. The program offered to convert the entire ▶

PHOTOGRAPH: JOHN KUCZALA

show into HTML for Web display, but I opted simply to e-mail the free player that comes with Power Show to my pal so he could watch what I'd made.

PLEASE REPLACE ALL DIVOTS

THE WAY TV golf announcers whisper, you'd think the game was being played in a church. Well, I know different. I've heard more blue streaks on the real links than in any nightclub, and the same holds true when I play **Links LS 1999**. The brand-new edition gives me four courses, including Scotland's St. Andrews Old Course; adds authentic-looking galleries (who never boo me); and has a lot of nice touches (my favorite: ropes to keep the unwashed at a distance). What really drives Links, though, are its realistic images—the courses and players look as good here as they do on my TV—and its top-of-the-leaderboard game play. Divots fly, an automated Arnold Palmer plays alongside me to give advice, and audio effects reproduce the whack of club on ball. This is golf the way it should be, without the sweat, greens fees, or silly pants.

FORE! Links LS 1999's realistic game play and sharp graphics make it almost as good as real golf.

GUYS NEVER ASK FOR DIRECTIONS

SOME PEOPLE BUY *National Geographic* for the pictures, some for the prose. I love it for the great maps the magazine publishes. Each time I unfold a map—whether it's of ancient Rome or Wyoming's rough country—I'm heading into undiscovered territory. Now I won't have to figure out how to refold those maps: **National Geographic Maps'** eight-disc collection includes every cartographic print published in the magazine's 109-year history. A slick search tool takes me to the right map quickly; zoom tools let me dive in for detailed looks, and I can print all or parts of a map in color or black and white. Not only is this one of the niftiest reference packages that's come along in years, it's also a superb stroll through mapmaking history.

PUT IT ALL ON PAPER

WHO SAID PCs would make paper obsolete? Programs like **PrintMaster Platinum 7.0** produce more paper around my house than Gutenberg ever dreamed of. I can pump out banners, cards, signs, newsletters, calendars, and even crafts. Virtually every printmaking package is a snap to use these days, even for kids, but PrintMaster surpasses them all by dumping an astounding amount of raw material into your computer. The suite includes nearly 175,000 clip art and photographic images, with another 15,000 accessible via the Internet, and even gives you tools for building personal Web pages. Other highlights? PrintMaster makes some of the classiest-looking greeting cards I've ever seen come out of an ink jet, and the new Cartoon-o-Matic tool generates the goofiest faces this side of Nickelodeon.

RIVETING RIVEN

LAST YEAR'S BOFFO hit Riven gets a minor face-lift, a better set of lungs, and a more compact package in this year's DVD edition. If your PC comes equipped with a DVD-ROM drive, this is the version you want. Rather than sprawling across four CD-ROMs, **Riven: The Sequel to Myst** packs itself onto a single DVD-ROM. But saving a few inches in my CD caddy isn't the only reason I kept this disc. I'd swear that Riven's visuals look cleaner, and that its many, many movie clips play much more smoothly than on CD-ROM. And the audio track—particularly the background sounds that make Riven (and its forebear) so immersive—is substantially clearer. Basic game play, however, remains ▶

F Y I

INTERNET e-mail gets to its destination lickety-split. Or it usually does, anyway: A new report says 93 percent of messages were delivered within 5 minutes in a recent testing period.

SOURCE: INVERSE NETWORK TECHNOLOGY

THE A-LIST

Encarta Reference Suite 99
Price: $100 street; Microsoft; 800/426-9400; www.encarta.msn.com
INFONET NO. 604

Kai's Power Show
Price: $50 street; MetaCreations; 800/846-0111; www.metacreations.com
INFONET NO. 605

Links LS 1999
Price: $50 street; Access Software; 800/793-0073; www.accesssoftware.com
INFONET NO. 606

National Geographic Maps
Price: $79 street; Mindscape; 617/761-3000; www.mindscape.com
INFONET NO. 607

PrintMaster Platinum 7.0
Price: $69 street; Mindscape; 617/761-3000; www.mindscape.com
INFONET NO. 608

Riven: The Sequel to Myst
Price: $40 street; Red Orb Entertainment; 800/567-2610; www.redorb.com
INFONET NO. 609

Robotics Invention System
Price: $200 street; Lego Mindstorms; 800/453-4652; www.legomindstorms.com
INFONET NO. 610

StarCraft
Price: $50 street; Blizzard Entertainment; 800/953-7669; www.blizzard.com
INFONET NO. 611

Unreal
Price: $55 street; GT Interactive; 800/610-4847; www.gtinteractive.com
INFONET NO. 612

You Don't Know Jack, The Irreverent Collection
Price: $50 street; Berkeley Systems; 800/757-7707, www.sierra.com
INFONET NO. 613

ILLUSTRATION: JACK GALLAGHER

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the same. That's a good thing, because Riven was always a really great game.

LEGO MY ROBOT!

RUN TO THE nearest high-end toy store. Shove aside the kids, knock down any grandmothers in the way. Just get your hands on Lego Mindstorms' **Robotics Invention System**. Part Erector set, part programming exercise, Robotics Invention System is a kit for making tiny (real, not virtual) Lego-based robots. You build a robot from hundreds of the well-known little plastic pieces; program its IQ on the PC by stringing together commands; download those instructions into a small plastic brick that contains an 8-bit processor and some RAM; and then set the robot loose. I built only a couple of robots —a motorized rover was the neatest—but the kit has enough pieces to assemble a wide range of designs, including a recycling buddy that collects soda cans. It's all just way too cool to leave to the kids.

DVD DELIGHT: Fascinating game play and beautiful visuals make the DVD version of Riven a great buy.

BRIGHTEST STAR IN THE SKY

GAMES WITH BRAINS are as rare as the proverbial hen's teeth. That's why **StarCraft** is on my list. This real-time strategy game has a better-than-average back story (involving a sci-fi universe where three races are at odds), missions that actually fit into that larger story, and narrative structure and pacing to rival a good novel. The game play's not bad, either. I devised tactics for my units and then maneuvered them through scenarios ranging from space combat to hit-the-beach style assaults on enemy planets and bases. Staying cool under virtual fire is a must, especially in this game's multiplayer mode.

THE UNREAL THING

PLOT MATTERS AS much to first-person shooters as it does to Hollywood blockbusters—in other words, not a whit—so it's not hard to summarize **Unreal**. You carry weapons, you shoot monsters, you kill monsters. End of story. What does matter is that the visceral meter reading of Unreal is...well, unreal. The amazing animation, background graphics, audio, and enemy IQ combine to produce an ambience that's arresting and addictive. I wandered through dungeons and towers, past gates and across moats, spilling blood at every turn. My biggest complaint is that multiplayer combat creaks rather than rocks. But when it's just me against the machine, Unreal is as real as it gets.

GAME SHOW FEVER

HOOT, HOLLER, YELL, scream. It's all part of the appeal of **You Don't Know Jack, The Irreverent Collection**, the best reason yet devised for gathering a bunch of people around a computer during a party. This trivia quiz game poses sometimes silly, often sidesplitting, occasionally just-plain-baffling questions to as many as three players, who wrestle over the keyboard to buzz in first. Heavy on pop culture, Jack is the most fun for adults ages 20 to 45. The Irreverent Collection comprises four volumes that together pose more than 3000 questions. Beats playing *Jeopardy* by shouting at the TV set.

Gregg Keizer is a freelance writer living in Eugene, Oregon. ■

F Y I

IF YOU'RE STILL not using antivirus software, now would be a good time to start. A recent study concludes that PC infections are up 48 percent from 1997.

SOURCE: INTERNATIONAL COMPUTER SECURITY ASSOCIATION

KEEPING UP

Trudge-Free Trade Show

THE COOLEST PC products debut each year at the Fall Comdex exhibition in Las Vegas. But if you can't make the trek, take a look at IShow.net (www.ishow.net), a Web site billing itself as the first online computer trade show. From the comfort of any browser-equipped PC, you'll be able to attend speeches, see demos of new products, ask questions, and request sales literature. The site premieres on November 16, neatly timed to coincide with Comdex 1998.

Yahoo Gets Clubby

YAHOO'S ALREADY-IMPRESSIVE personalization feature on its My Yahoo site (www.my.yahoo.com) just keeps getting more personal. The newest additions are Yahoo Clubs, which let you start your own online community on any topic you choose (complete with message board and chat room); and Yahoo Calendar, a personal schedule you can check from any Web browser. As you'd expect on the Web, both these new services are free.

The Man Who Sold the Web

MINDSPRING, EARTHLINK...and David Bowie? That's right. The iconoclastic rock star has recast himself as an Internet service provider. Other ISPs may match BowieNet's rates ($20 a month for unlimited access). But the new service's fringe benefits—which include Bowie cybercasts, audio clips, and photos, plus an e-mail address at davidbowie.com—are, well, unique. Check out BowieNet at www.davidbowie.com.

Big-Screen PC on the Cheap

GATEWAY'S DESTINATION systems have long been the ultimate in home PCs, but their high-end components have put them out of the reach of bargain hunters—until now. The new $1999 Destination XTV has a 333-MHz Celeron CPU, a 27-inch cable-ready TV/monitor, a DVD-ROM drive, and a wireless keyboard. And if the standard 3.2GB hard drive is too skimpy, a 6.4GB model costs only $50 more. Call Gateway at 800/428-3929 or visit www.destination.com. —Harry McCracken

ILLUSTRATIONS: JACK GALLAGHER

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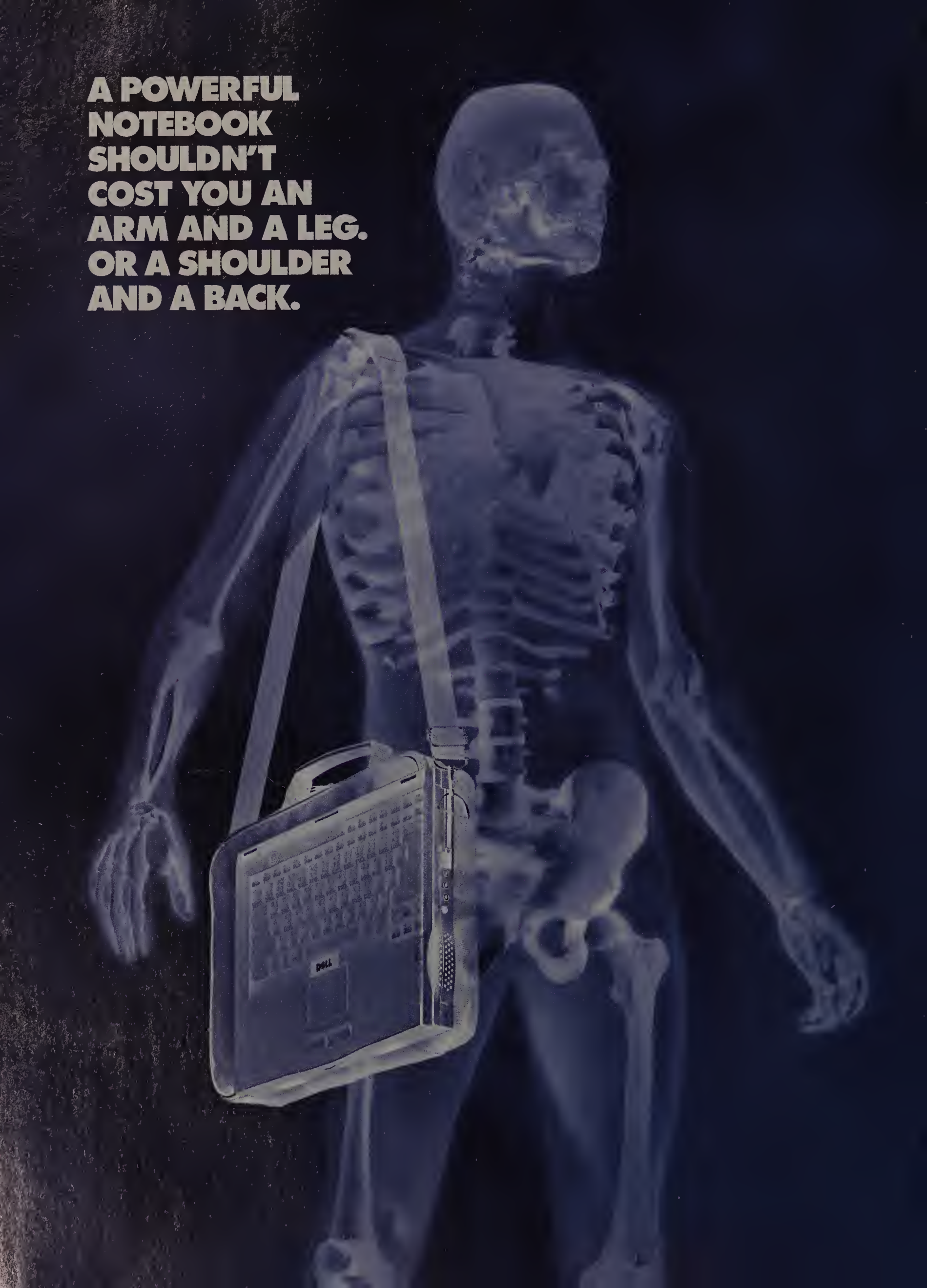
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The Bass Virus Is Coming! The Bass Virus Is Coming!

DANGER! VIRUS WARNING! Do not read this column!! It contains the deadly BASS VIRUS!! It will erase everything on this page AND your hard drive (and probably damage your brain). Please FORWARD THIS WARNING TO EVERYONE YOU KNOW!! THIS IS NOT A JOKE!!!

Yeah, sure, you're laughing. So many people have received the exclamation point–laden Good Times virus hoax that it's, well, laughable. But when I got an e-mail advising me that the Win95.CIH virus would strike in a few days, I felt a twinge of concern. The threat *looked* authentic, and the media blitz that followed didn't help. (Yes, I'm media, too, but hey, I also use a PC.)

The stark reality is that insidious viruses *are* ready to infect your system. Still, in 16 years of computing (and God knows how many downloads), I've picked up fewer than a dozen of them. Once, a *PC World* editor sent me a document containing a Word Macro virus. And like hundreds of other journalists, I had my system infected by a nasty virus on a CD-ROM distributed by a public relations firm. (The group's now representing Russian bankers peddling the ruble.)

But the important thing is that I was able to eradicate the viruses before they did any harm. My strategy is simple: I use antivirus software regularly, and I update my program's virus signature database often. If my routine changes—say, I'm downloading a lot of shareware—I take extra precautions. I also scan for viruses *before* I back up—no exceptions.

VIRUS BUSTERS

THERE ARE LOTS of ways to protect yourself from viral attacks. But first you need to look at how you use your PC and figure out your level of exposure. Are you a low-risk user who rarely downloads files or receives e-mail attachments? (Yes, Mom, I'm talking about you.) Then log on to Trend Micro's Web page (www.antivirus.com) and follow the HouseCall logo. The company's HouseCall Virus Check-Up can scan your drive for viruses right from the site and simply delete infected files.

> "More **data** has been lost by spilled cups of **coffee** on the **keyboard** than by any virus **attack**."

Do you do lots of downloading from the Net? Grab a free copy of ESafe's ViruSafe Web (www.virusafe.com). ViruSafe integrates into any version of Internet Explorer or Netscape and scans files as they download. It's the one I use.

Another handy program is Frisk Software's F-PROT (www.datafellows.com/vir-info), a freebie for private use. It's a bit geeky, but I use it to scan my PC from the DOS prompt, and it works just fine. Frequent updates are available, all for the price of a download. Both ViruSafe and F-PROT are available on PC World Online's FileWorld (www.fileworld.com).

HIT OR MYTH

WHEN I HEAR about a new virus, I ignore the media hype and head to Rob Rosenberger's Computer Virus Myths home page (www.kumite.com/myths). He gleefully blows the lid off everything from the Budweiser Frogs virus to the Win a Holiday hoax.

The latest well-publicized threat to the computing world's well-being is the Win95.CIH virus. It strikes Windows 9*x* systems on the 26th of the month, and it can wipe out the software code stored on your PC's flash BIOS, preventing your system from booting.

Unfortunately, the media have turned somersaults over this menace, warning of dire consequences and even suggesting you keep your PC turned off that day. (Personally, I think that's a grand idea, since my deadlines fall close to the 26th.)

Myth-buster Rosenberger told me to be cautious but not to worry about the virus. "If there are 200 million computers," he says, "and a whopping number of them—say, 10,000—are hit, then the odds of your PC getting nailed by the Win95.CIH virus are 20,000 to 1." And virus expert Ross M. Greenberg says, "More data has been lost by spilled cups of coffee on the keyboard than by any virus attack."

By the way, did you hear about the Paul Revere antivirus program? It emits a beep if it detects an impending virus infection—one if by LAN, two if by C:. (Insert virtual rim shot here.)

Find files mentioned in this article on PC World Online's FileWorld at www.fileworld.com. Contributing Editor Steve Bass is a licensed marriage and family therapist and the president of the Pasadena IBM Users Group in California. He can be reached on PC World Online *(see page 14 for more information).* ■

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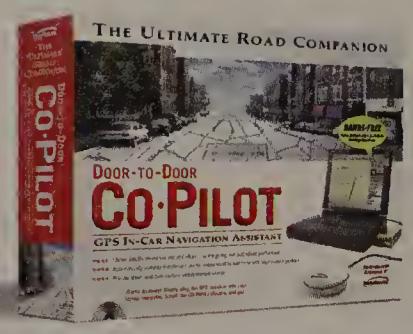

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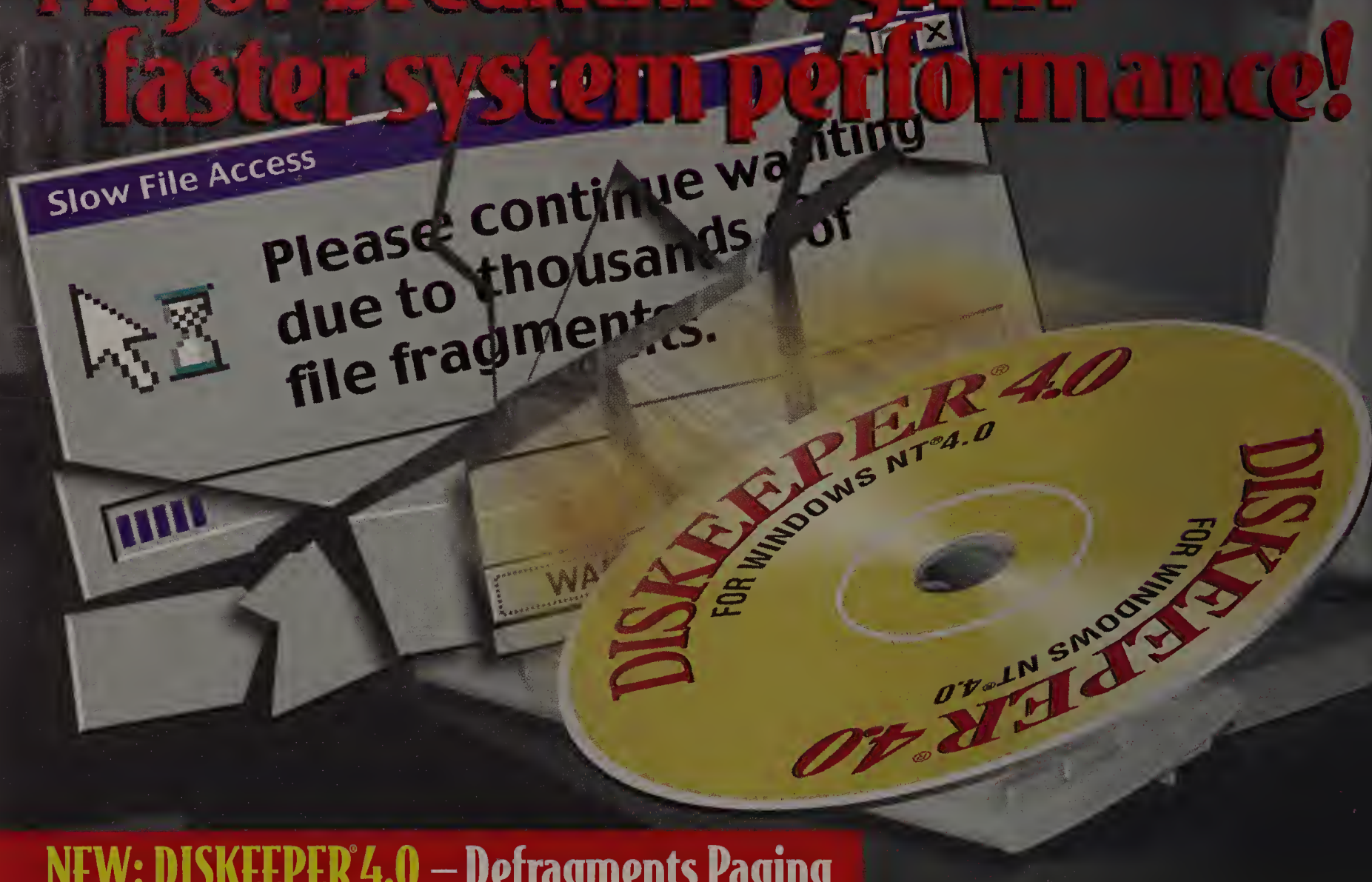

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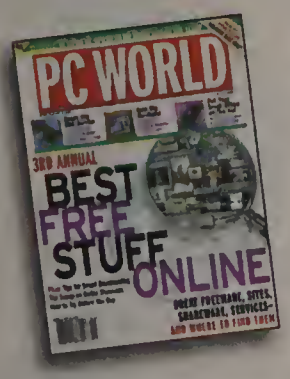

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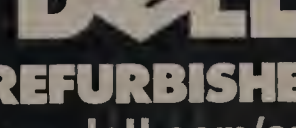

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WINDOWS TIPS SCOTT DUNN

When System Agent Loses Its Mind

95 ONE HANDY WAY TO use the Microsoft Plus pack's System Agent scheduling tool is to have it periodically run disk maintenance programs such as ScanDisk and Disk Defragmenter (both come with Windows 95). The dialog box options within System Agent and these utilities let you set up the programs to run without further intervention by you. Unfortunately, System Agent sometimes ignores your chosen options, in which case your disk utilities will ask you for information anyway. What's going on?

Chances are you have corrupt System Agent entries in the Windows 95 Registry, that arcane storehouse of Windows configuration information. The easiest way to fix this problem is to reinstall System Agent. But doing so will destroy all your scheduled tasks, unless you first perform these five steps:

1. Turn off System Agent: Choose *Start•Programs•Accessories•System Tools•System Agent.* In the System Agent window, select *Advanced•Stop Using System Agent;* then click *Yes* to confirm you're turning it off.
2. Rename the sage.dat file (which stores all your scheduled tasks) **sage.bak.**
3. Reinstall System Agent from your original Microsoft Plus CD-ROM. Once it's installed, turn it off again, as in step one.
4. Delete the new sage.dat file created by Plus's setup, and rechange the name of sage.bak to **sage.dat.**
5. Restart System Agent by clicking *Start•Programs•Accessories•System Tools•System Agent.*

To make sure that each of your scheduled tasks has been preserved, select a task and choose *Program•Properties* to double-check its settings.

Windows 98 has a similar utility called Scheduled Tasks. This utility seems not to have the same problems that plague System Agent—but only time will tell.

VIEW TO THE MAX

98 IN THE AUGUST issue, I pointed out how you can make folder and Explorer windows zoom to fill the screen just by pressing **<F11>** (and how pressing it again restores the normal view). The only thing left outside the folder or Explorer window is the toolbar. But Howard Hover of Palm Harbor, Florida, points out that you can take this sleight of hand even further.

After you've pressed <F11>, right-click the toolbar and choose *Auto Hide.* The toolbar will disappear when you move the pointer away from the top of the screen, but it will pop back into view when you return to the toolbar location (or when you press **<F11>** to return to normal view). Note that when Explorer (or Internet Explorer) is running in full-screen view, Windows' taskbar behaves as if you had its Auto Hide feature turned on—even if you don't (right-click the taskbar and choose *Properties* to try this option).

While you're at it, why not make that toolbar more useful? Just right-click it

ILLUSTRATION: JAMES YANG

again and choose *Menu Bar* to see your menu commands alongside the tool buttons. This arrangement is best for screen resolutions of 800 by 600 and higher, unless you don't mind hiding some of the buttons or menu commands (just drag the handle to the left of the File menu to position the menus). If your video card and monitor are capable of very high resolutions (1152 by 864 or higher), you can squeeze even more onto this bar—just right-click the toolbar and choose *Links* or even *Address Bar*.

For more on enhancing folder views in Windows 9*x*, IE 4.0, and NT, see "Better Folders: It's All in the Details," next page.

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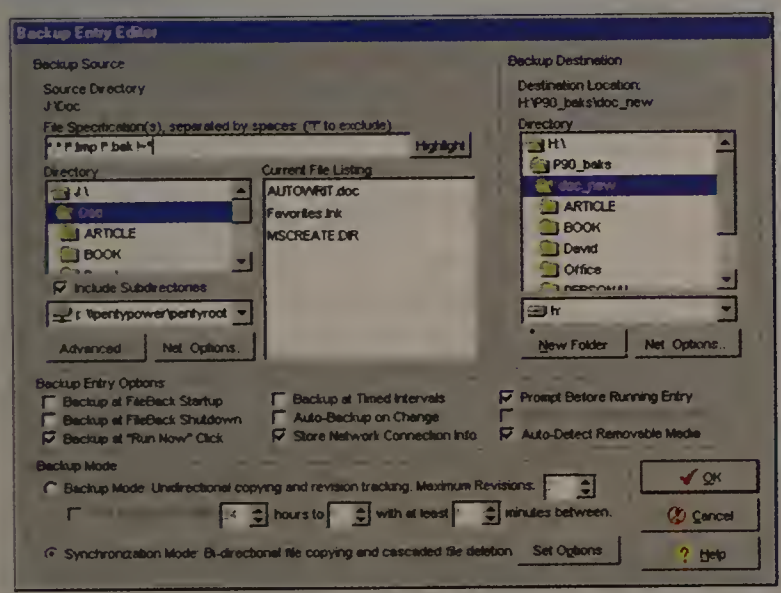

KILL THE COMMON COMMA

WINDOWS' CALCULATOR accessory may be handy, but it's none too bright. If you type **1,001 - 1,000** and press **<Enter>**, you'll get 0.001 as the answer. That's because Calculator isn't programmed to recognize commas as a numbers separator, even if you specify the comma as a separator in the Regional Settings (Windows 9*x* and NT) or International (Windows 3.*x*) control panel.

In fact, whenever you type a comma, Calculator converts it into a period on the sly; it interprets the comma key as a decimal point, which explains the math example cited above. The moral of the story: Either select numbers with the mouse or get into the habit of entering numbers from the numeric keypad, where you won't be as tempted to use the comma key (since that keypad doesn't have one).

SEIZE CONTROL OF WINDOWS' SECRET LAUNCHPAD

SOME PROGRAMS mysteriously launch whenever my Windows system boots, even though I don't see them in the StartUp folder or in win.ini or system.ini. What's going on?

Douglas Hiroshi Masuda, Honolulu

WINDOWS 95 AND 98 have various ways of starting applications automatically when you start your system—through entries in an .ini file or icons in the StartUp folder, for example (see "Don't Get Me Started!" in June's *Windows Tips*).

Unfortunately, it doesn't stop there. Applications can ensure that they start automatically by inserting command lines at any of a number of locations in that recondite repository of system settings known as the Windows Registry. Fortunately, Windows slips you a few tools for modifying the Registry to suit your needs.

If you have Windows 98, you're in luck: That operating system's new System Configuration Utility makes it a snap to prevent applications from launching when you start Windows. Simply choose *Start•Run*, type **msconfig**, and click *OK*. When the System Configuration Utility appears, click the *Startup* tab to see a list of all applications that are launched either from the Registry or from your StartUp folder. Uncheck the box next to each application you want to prevent from starting in the future.

While you're there, you can also click the *Win.ini* tab, double-click *[windows]* (or click the plus sign) to expand it, and uncheck the boxes for the *load=* and *run=* lines to disable applications started from there (see **FIGURE 1**). When you're done, click *OK*. The System Configuration Utility will want to restart your computer; ▶

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DON'T MISS ADDITIONAL HERE'S HOW information at **www.pcworld.com/heres_how.**

Better Folders: It's All in the Details

Click any column heading to sort in ascending order or in descending order (Windows 9*x* and NT 4.0).

Size each column to fit its widest entry by double-clicking the right edge of its heading (Windows 9*x* and NT 4.0).

Hide a column by dragging the right edge of its heading to the left until the column entirely disappears (Windows 9*x* and NT 4.0).

Name	Size	Modified	Type	Attributes
Backup files		7/13/98 3:58 PM	File Folder	
Old projects		8/21/98 3:08 PM	File Folder	
Apr reports completed.doc	42KB	7/28/98 4:12 PM	Microsoft Word Document	A
budget.bat	1KB	6/1/98 11:22 AM	MS-DOS Batch File	A
E-mail comments from Mr. S.txt	1KB	6/11/98 2:48 PM	Text Document	A
End of year report.doc	217KB	7/17/98 2:00 PM	Microsoft Word Document	A
Expense chart.bmp	901KB	1/15/98 4:31 PM	Bitmap Image	A
First quarter deadlines.xls	524KB	7/1/98 11:05 AM	Microsoft Excel Worksheet	A
Ie4bak.dat	3,646KB	10/1/97 5:27 PM	DAT File	RH
mockup.pdf	139KB	7/25/98 10:11 PM	Adobe Acrobat Document	A
Nov-Dec 1998.zip	22KB	7/31/98 7:12 AM	WinZip File	A
Q3 1998.xls	2,098KB	6/9/98 1:13 PM	Microsoft Excel Worksheet	A
Q4 1998.xls	525KB	7/1/98 11:17 AM	Microsoft Excel Worksheet	A
Shortcut to csim95.exe	1KB	8/21/98 3:07 PM	Shortcut	A
Shortcut to pd98eval.exe	1KB	8/21/98 3:07 PM	Shortcut	A

Arrange columns in the order you want by dragging column headings to the left or to the right (Windows 98 and Internet Explorer 4.0).

To display file attributes (archive, hidden, system, read only), select *View•Folder Options*, click the *View* tab, and check *Show file attributes in Detail View*. You may need to close and reopen the folders to see the resulting changes (Windows 98 and IE 4.0).

click *Yes* if you want to try out the new setup immediately. The items that you unchecked won't start again. To restore their autolaunching status, open the System Configuration Utility again and put checks in the appropriate boxes on the Startup or Win.ini tabs.

In Windows 95, the easiest way to prevent applications from launching when Windows starts is to use the System Policy Editor. (If you haven't already installed the System Policy Editor, search for the Poledit folder on your Windows CD-ROM, or download it from Microsoft at www.microsoft.com/windows95/info/admintools.htm. The accompanying text file explains how to install it.)

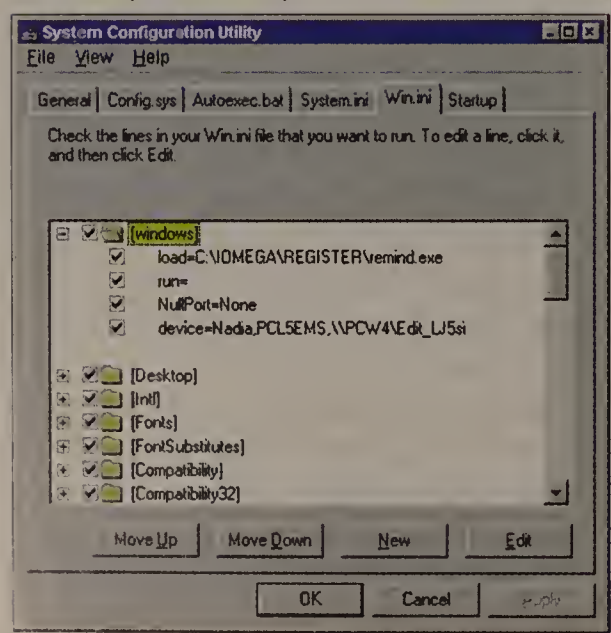

FIGURE 1: DISABLE WIN.INI-BASED applications by using Windows 98's System Configuration Utility.

To start the System Policy Editor, choose *Start•Run*, type **poledit**, and click *OK*. Next, choose *File•Open Registry*, double-click the *Local Computer* icon, and click the plus sign next to *System*. If the Run box is checked, select *Run* and click the *Show* button in the Settings for Run area. In the Show Contents dialog box, select an application that you want to prevent from running at start-up, and click *Remove* (**FIGURE 2**). Repeat this step for each application you want to remove, and then click *OK*. If the Run Services box is checked, select *Run Services*, click *Show*, and use the same procedure described above to remove items you don't want Windows to launch automatically at start-up. Click *OK* twice and then choose *File•Save*.

If you subsequently decide to restore items that you've removed, you're in for some typing. Select either *Run* or *Run Services*, click *Show*, click *Add*, and type the name of your program once in the first box and again in the command line (the value) of the second box. Then click *OK* three times and choose *File•Save*. (You shouldn't mess around with the Run Once option; it can automatically launch applications, too, but it's intended for one-time use—for example, to restart installation-related software after restarting your computer.)

Bonus tip: It's also possible to launch applications automatically using the Add button in the Show Contents dialog box in such a way that less-informed members of your office or family won't know how to disable the autolaunch. This trick works in both Windows 98 and Windows 95. The only difference involves the appearance of the Local Computer Properties dialog box in Windows 98: Click the plus sign next to *Windows 98 System* and then the plus sign next to *Programs to Run* to select the *Run* or *Run Services* option. Then click the *Show* button and the *Add* button, as described above.

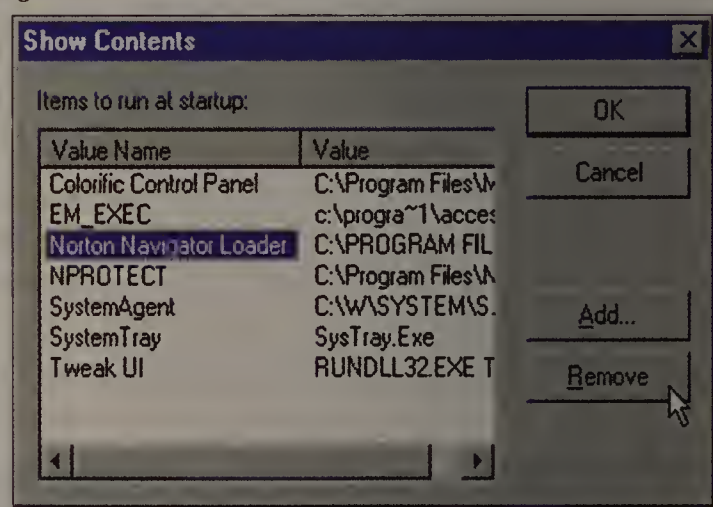

FIGURE 2: ADD OR REMOVE APPLICATIONS launched from the Registry by using Windows 95's System Policy Editor.

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Is It Time to Upgrade to Windows NT?

I USED TO ASK myself that question every time Windows 95 crashed while I was trying to juggle spreadsheets, databases, and e-mail. Hours of crucial work were wiped out in an instant because Windows 95 no longer could keep track of the tangled bits.

If you aren't asking yourself the same question now, you probably will be soon. That's because NT, once the ugly stepchild of Microsoft operating systems, has blossomed into a valuable tool for business-oriented computing. Armed with the same interface as Windows 9*x*, rock-solid reliability, and effective security features, NT 4.0 has found a home on over 15 million computers.

What's more, Microsoft has made it clear that Windows 98 is its last 16-bit/32-bit hybrid OS. Since all Wintel roads lead to NT, you'll likely have to master this operating system if you want to stay productive. A substantial proportion of *PC World*'s readers—nearly 14 percent by our last count—already use NT.

If you've already upgraded to NT, you need information about making it run better. You'll find plenty of that in this column over the coming months. Not sure whether the upgrade is right for you? See the table below. NT is certainly not for everyone. It's pricey, for one thing. A single-user version of NT Workstation costs about $230 retail (versus $89 for Windows 98). Despite NT's improved compatibility, your legacy hardware may not run, since the operating system lacks Plug and Play support. If you run 16-bit apps, your software may not run under NT's strict resource-protection scheme. Finally, NT may simply be too much OS for your old 486 or Pentium classic.

TAKE STOCK

IF YOU DO DECIDE to take the leap, put a premium on planning and preparation. The upgrade itself may take 45 minutes, but you should spend hours, if not days, taking stock of your hardware and software. Find NT-compatible drivers for your various devices and save them to disk, and round up your scattered application disks so they're on hand when you need to install them over NT. And don't forget to back up your data!

If you're moving from Windows 95, get a complete inventory of your system. This will help you identify IRQ conflicts and solve other problems that might crop up after you lose the Plug and Play safety net.

1. Select *Start•Settings•Control Panel,* double-click the *System* icon, and click the *Device Manager* tab.
2. Make sure the Computer item at the top of the list is selected, and click the *Print* button at the bottom of the System Properties dialog box.
3. In the Print dialog box, click the *All devices and system summary* button and then click *OK.* This will print an exhaustive report on your system's hardware.

For reports on specific parts of your system, click the *Properties* button in the System Properties dialog box. Then select one of the four radio buttons at the top of the Computer Properties dialog box to review settings for interrupt requests, input/output devices, direct memory access, and memory.

If you're upgrading from Windows 98, click *Start•Programs•Accessories•System Tools* and select *System Information.* Click the plus sign next to Hardware Resources to see individual assignments of IRQs, DMAs, I/O addresses, and other resources.

PC World *Contributing Editor Michael Desmond is a freelance writer and consultant living in Burlington, Vermont. See page 14 for contact information. Send him your column queries or tips via www.michaeldesmond.com/nt.htm.* ■

The New Column on the Block

THIS IS THE FIRST installment of a new column offering tips, tricks, work-arounds, and general advice regarding Windows NT. The main focus is NT Workstation, which means that we'll address the needs of the end user rather than the IS manager. Mike Desmond is an accomplished technology writer whose insightful articles have graced the pages of this magazine for several years. We welcome your input, and we'll pay $50 for any tip or question used in the column. See the bottom of the column below for contact information.

THE UPGRADE DILEMMA: IS NT FOR YOU?

Stay with Windows 9*x* if...	Get NT now if...
You typically run only two or three business applications at a time.	You run more than three or four CPU-intensive applications at a time.
Your system seldom crashes.	You must reboot frequently, or your system must remain on for remote access and other applications.
Others do not have access to your system, or you have no confidential data to protect.	You are concerned about securing your PC against intrusion, either accidental or intentional.
Your system is a Pentium-90 or slower with only 16MB of memory.	Your system has two or more CPUs for multiprocessing.
You run a lot of games and multimedia software, or you still use DOS applications.	Your system hosts a Web site, acts as a network server, or runs demanding 3D and graphics design software.
You use USB devices, DVD-ROM drives, or other peripherals that lack drivers for NT.	You want to enjoy the full benefit of SCSI-based hard disk arrays and video capture devices.

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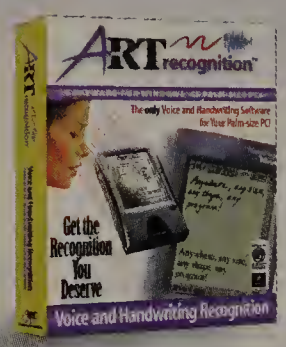

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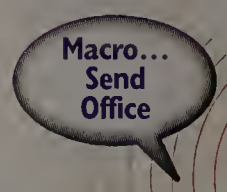

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- **Go to** + an application name to launch that application.
- **Dial** + contact name from your address book to dial phone numbers.
- **E-mail** + contact name opens and addresses a new e-mail form.
- **Fax** creates and addresses a new fax form. (Requires bFax Express).
- **Show Details** + contact name to display the complete record.
- **Get Mail** launches the Inbox, dials your e-mail server, and checks on-line for new messages.
- **Macro** executes a user-defined macro – commands like "cut" and "paste" – or inserts phrases or boiler plate text into a document.
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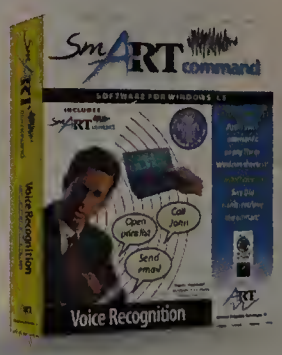

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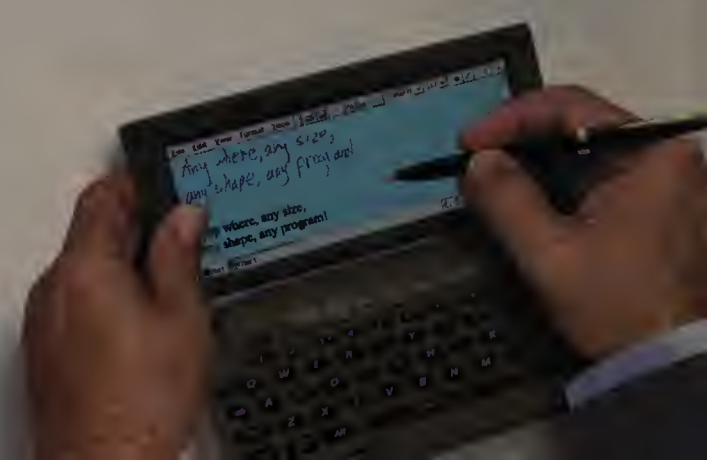

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YOUR QUESTIONS ON: Diagnosing a sickly monitor ◆ **Making a cable connection**

Safely and Painlessly Merge Multiple Partitions

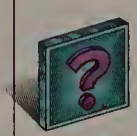
MY SYSTEM'S 4GB drive is split into two partitions. Now that I've upgraded to Windows 98, I'd like to merge the two partitions into one. I have programs on both partitions, and Windows applications don't work if you move them from one drive to another. How do I merge the partitions without losing half of my programs?

Brian Goldberg
North Miami Beach, Florida

WINDOWS 98's Drive Converter utility can safely convert each partition to FAT32, but it will not help you combine multiple partitions. Happily, PowerQuest's $69 PartitionMagic 3.0 enables you to take care of both tasks. Here's what to do:

1. Using PartitionMagic or Drive Converter, convert both partitions to FAT32.
2. Start PartitionMagic, shrink D: as much as possible, and expand C: to fill the free space (see **FIGURE 1**).
3. Reboot into safe mode: As the reboot process starts, press and hold down **<F5>** until the Windows logo appears.
4. Open Explorer and hold down **<Shift>** as you drag as many folders onto C: as will fit (moving them, not copying them). When you move folders, make sure you send them to locations on C: that correspond to where they were on D:. For instance, move D:\Office to C:\Office, not to C:\Program Files\Microsoft Office.
5. If you can't fit everything onto C:, you'll have to reenter PartitionMagic. This is complicated by the fact that you cannot go from safe mode to MS-DOS mode, which PartitionMagic must use to resize C:. The best solution is to restart Windows in the default mode. You'll get error messages as it can't find programs you've moved, but you can ignore these. Once you're in PartitionMagic, repeat steps 2 through 4 until D: is empty.
6. When no files are left on D:, reenter PartitionMagic. Delete the D: partition, and expand C: to occupy the entire drive.
7. Reboot into safe mode as in step 3. Launch Drive Mapper, which you'll find in PartitionMagic's Start menu. The Drive Mapper wizard will help you change all references to D: into C: so that your programs will work properly.

MONITOR BLUES



MY PACKARD BELL 1024S monitor is only a year old, but it recently developed a blue tint. Is there a way to fix it, or do I need a new monitor?

Edward Wright
Phoenix

HOPEFULLY, it's just a loose connection. To find out, check the connection point where the monitor's cable attaches to the computer. If it's loose, the monitor may be receiving only part of the signal—one or two colors instead of all three. Jiggle the connector around a bit and see if that improves the picture.

If jiggling improves the problem, but only temporarily, unscrew the connector, blow off any dust, and carefully reattach it. That should do the trick.

You might also check to see if there are bent pins on the connector end of the cable, and straighten out any you find with needle-nose pliers.

If you have another computer handy, try plugging your monitor into that. You might have a perfectly good monitor hooked up to a bad graphics card.

If none of these fixes works, your monitor probably has a faulty circuit board or picture tube. If the monitor's still under warranty, contact your vendor. If the warranty has expired, take it to a local repair shop (and don't forget to ask for a free estimate). If the culprit is the circuit board, the repair should cost you about $100. But if your tube is bad, you're better off just buying a new monitor. ▶

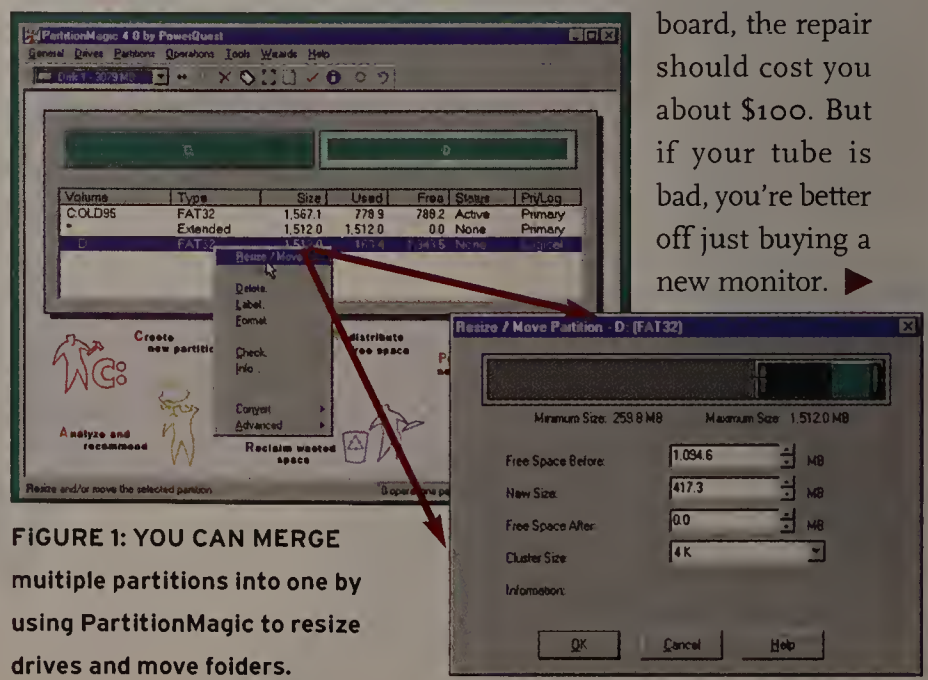


FIGURE 1: YOU CAN MERGE multiple partitions into one by using PartitionMagic to resize drives and move folders.

Alphabit Soup

CONFUSED ABOUT the difference between KB and kb or MB and mb? You're not alone. So let's settle this once and for all: In *PC World*, a lowercase *b* refers to bits, while an uppercase *B* stands for bytes. For example, transfer rates for modems and other Internet access devices are usually measured in kilobits per second (kbps). But other data transfer rates—such as those describing IDE or SCSI bus transfer speeds—are routinely measured in kilobytes per second (KBps) or megabytes per second (MBps).

ILLUSTRATIONS: JEFFREY PELO (TOP); JAMES YANG (BOTTOM)

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CONNECT A WIN 95 PC TO A WIN 3.1 LAPTOP

I HAVE A DESKTOP computer running Windows 95 and an old laptop with Windows 3.1, and I'd like to link them together using a parallel or serial cable. I've found ways to do this if they both run Windows 95, but not across the two operating systems. I have tried using freeware programs and DOS 6.22's Interlink—without success. What do you recommend?

Kevin Nowers, Cedar City, Utah

INTERLINK SHOULD work here. Let me go over how to set it up.

To make a parallel connection (which is faster than a serial one), you need a bidirectional, male-to-male parallel cable. These cost as little as $9.

Once your computers are connected, use a floppy disk to "sneakernet" a file called intersvr.exe (Interlink Server) from your laptop's C:\dos directory to your PC's C:\Windows\Command folder. While that folder is still open, drag intersvr.exe to the desktop to create a Shortcut.

Right-click the Shortcut and select *Properties*. Click the *Program* tab, and then the *Advanced* button. Check *MS-DOS mode* and then click *OK*.

Back on the laptop, go to Program Manager, select *File•Run*, and run the command **sysedit**. This brings up several files for editing. Click the *CONFIG.SYS* title bar, and add the line **device=c:\dos\interlink.exe** to the bottom of that file or before any other line that starts with 'device='. Press **<Alt>-<F4>** to close Sysedit, and confirm that you want to save the changes.

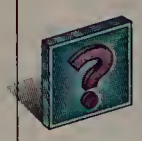
Now you're ready. On your desktop machine, launch the Interlink Server Shortcut. If you're asked about exiting Windows, click *Yes*. (Sorry, but you can't multitask on the server.) Wait until you see the Interlink Server screen.

Now move to the laptop, exit Windows, and reboot. If everything works properly, your desktop drives should appear as very slow drives on your laptop. Just remember that you won't get any long file names.

You should be able to access these drives just fine in Windows 3.1. Conflicts being what they are, however, you may run into problems. If Windows doesn't behave properly with the extra drives available, exit it and do your file handling from the DOS prompt.

If that doesn't work, I have one other suggestion: Format a floppy on your laptop, using the option to copy the system files (from the DOS prompt, the command is **format a: /s**). On this bootable disk, create one file, config.sys, consisting of one line: **device=c:\dos\interlink.exe**. Boot from the floppy when you need to access your desktop computer. That way, there won't be anything else in place to conflict with Interlink.

KILL THE TASK SCHEDULER



HOW DO I prevent the Task Scheduler from starting up when I launch Windows 98? It doesn't appear in the Start menu's StartUp folder.

Paymon Bahrami, Albany, California

HERE'S HOW YOU can block this memory hog (by the way, this also applies to Windows 95 users who've installed Microsoft Plus, which comes with the same Task Scheduler).

Double-click the *Task Scheduler* icon in the system tray to open the Scheduled Tasks folder. Select *Advanced•Stop Using Task Scheduler* (see **FIGURE 2**). The icon will disappear from the system tray and won't return when you reboot.

If you change your mind, here's how to get Task Scheduler back: In Win 98, open *My Computer* and double-click the *Scheduled Tasks* icon. Select *Advanced•Start Using Task Scheduler*. (Win 95 lacks that icon; users should select *Start•Run* and type **sage**.)

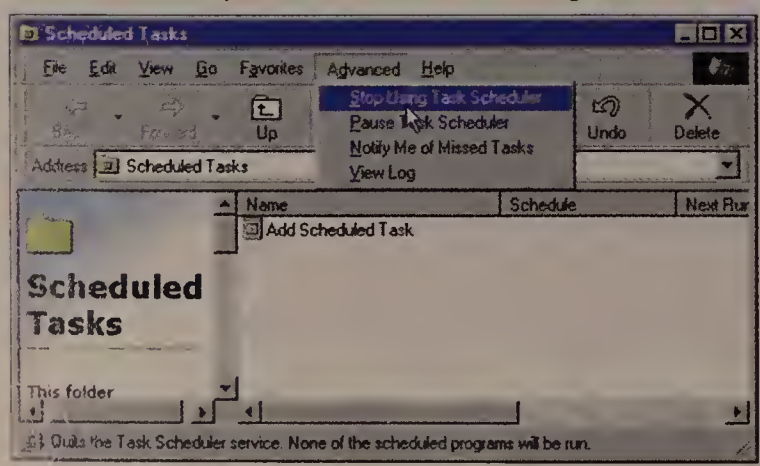
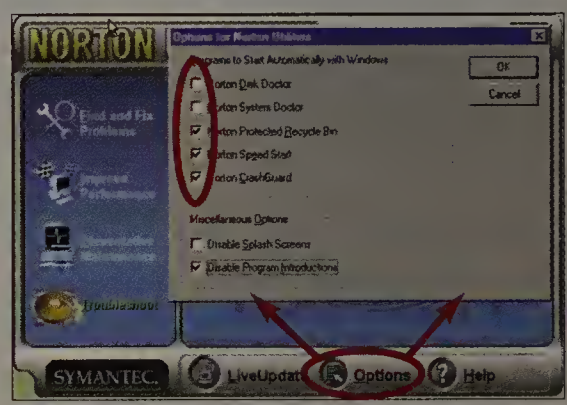


FIGURE 2: WINDOWS 98'S TASK SCHEDULER looks—and functions—like a regular folder but adds the Advanced menu.

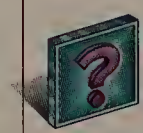
Easy on the Norton

AFTER YOU INSTALL Norton Utilities 4.0, a lot of its programs load automatically each time you boot Windows. What if you don't want them all? You can't do the obvious thing and remove them from the StartUp folder, because they're not there to begin with.

To choose which Norton programs you want to run at start-up, launch the Norton Integrator and click the *Options* button. In the next dialog box, you'll find check boxes for turning the various auto-starting programs on and off.



HIDDEN CACHE FOLDERS?



I RECENTLY HAD TO snoop around in DOS. While I was there, I discovered that IE's cache folder contains four hidden folders. How come Windows Explorer doesn't show those hidden folders?

Kevin Weinman, Cambridge, Ohio

TO PUT IT SIMPLY, C:\Windows\Temporary Internet Files is a weird folder that follows its own rules. For performance reasons, IE spreads the files it caches into four system folders within Temporary Internet Files. (These are not four redundant copies of your cache, but four parts of the whole caboodle.) So when you look at C:\Windows\Temporary Internet Files in Windows Explorer, you see the contents of all of these system folders. But you won't see the only two files that are actually there: index.dat and desktop.ini.

Answer Line welcomes questions and tips and pays $50 for published items. Humor columnist Lincoln Spector is a PC World *contributing editor. See page 14 for contact information.* ■

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Better Browsing With Active Channels

IF NOT PROPERLY controlled, Internet Explorer's Active Channels can take over your Desktop, your system resources, and your life (see **FIGURE 1**). Here's how to add and remove them from your Desktop and control their various intrusive properties.

To use channels smoothly, you must configure Internet Explorer as your default browser. You can access Active Channels with Navigator (they're just Web pages), but you may get Java errors.

Get the Channel Bar on screen: If you don't have a Channel Bar on your Desktop and for some strange reason would like to have it, click *Start•Settings•Active Desktop•Customize my Desktop*. Next, under the Web tab, check both *View my active Desktop as a Web page* and *Internet Explorer Channel Bar*. Click *OK*. Remember, you can also view the Channel Bar within IE, where it's less intrusive and can be hidden more easily. To activate it from inside the browser, just click the *Channels* button (the one that looks like a satellite dish) on the toolbar. To close it, click it again.

Kill the Channel Bar: If you don't approve of letting that obnoxious Channel Bar hog valuable Desktop acreage, vanquish it by clicking the *X* icon in the top-right corner of the bar (if the *X* isn't there, move your cursor to the top of the bar and it will appear). When Windows asks whether you want the bar to come back the next time you boot, tell it *No*.

Add and remove channels: To add a Web page you're viewing to the Channel Bar, click the *Add Active Channel* button featured on that Web page. But you probably don't want to receive an endless stream of flashing headlines, so make sure you set limits. In particular, don't let the channel determine how frequently it will download updates. It may ask a question like 'How should subscriptions be updated?' or it may offer a Customize Subscriptions button. Use whatever option it provides for manually updating the channel.

To remove channels from the bar, right-click the channel's icon and select *Delete*.

Suggestion: Want easy access to a Web site from your Desktop rather than from the Channel Bar? While viewing a Web page, right-click a blank spot on the page and select *Create Shortcut*.

Put a channel on your Desktop: Some channels include graphic elements—blinking boxes, scrolling marquees, gratuitous ads, and the like—that you can add to your Desktop. If this appeals to you, make sure Web content is enabled for your Desktop: Select *Start•Settings•Active Desktop•Customize My Desktop*. Click the *Folder Options* button and then the *General* tab. Select *Custom, based on settings you choose*, and click the *Settings* button. In the Custom Settings dialog box, under Active Desktop, pick *Enable all Web-related content on my Desktop*. Click *OK*.

If a Web page contains an *Add to Active Desktop* button, you can add the channel to your Desktop. But before you click that button, know what you're getting into. Some channels plaster your Desktop with their own content, rife with ads and ticker headlines. Others deposit ugly flashing or revolving logos. Usually these elements are designated by icons on the channel screen near the Subscribe button. Be sure to look them over carefully before you click Add to Active Desktop. And once again, set the channel for manual updating.

Remove channels from your Desktop: If you're tired of the blinking boxes and other gewgaws on your Desktop, head to *Start•Settings•Active Desktop•Customize my Desktop*. Under the *Web* tab, uncheck the box next to the listed channel.

Continues on page 273 ▶

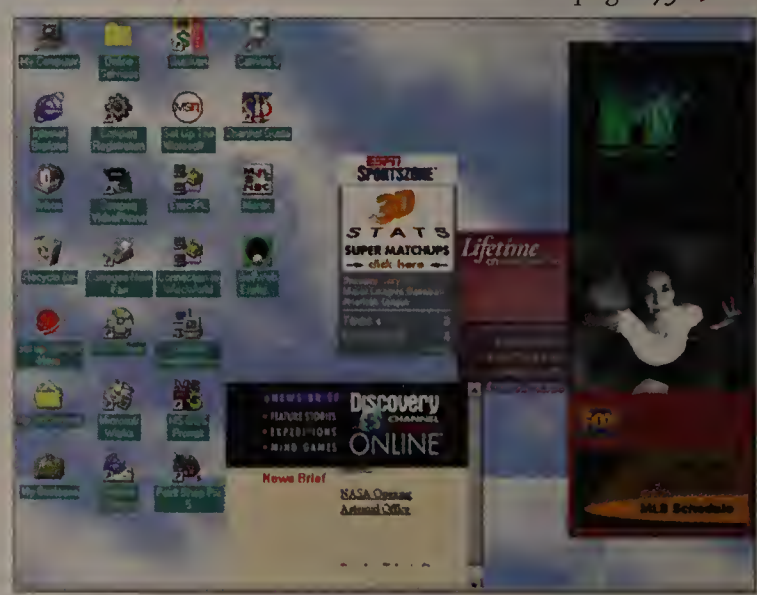

FIGURE 1: DO I REALLY WANT MY MTV? IE channels can take over your Desktop—and several of them blink.

Now You See a Toolbar, Now You Don't

YOU CAN EXPAND your view of a Web site in IE 4, even beyond what a standard maximized window provides, by selecting *View•Full Screen* or pressing <F11>. But Stefan Laube of Newport Beach, California, writes that you can enlarge the vista even more by hiding the top toolbar. Simply right-click the toolbar and check *Auto Hide*. The toolbar will disappear, reappearing whenever you roll the mouse over its former location.

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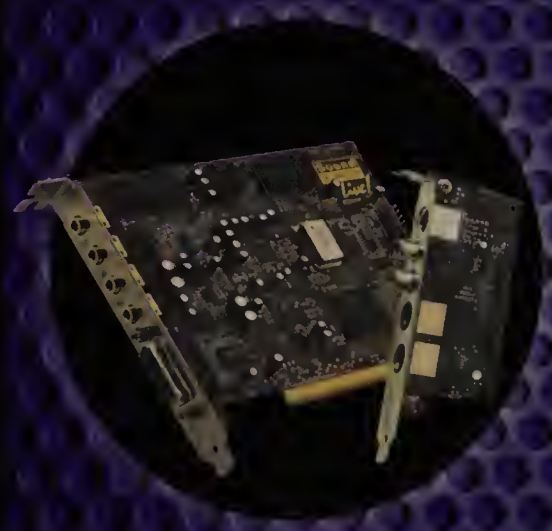

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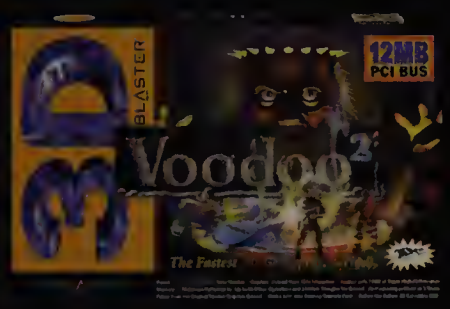

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◆ = best suited
● = good choice

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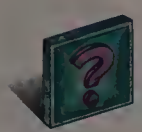
Continued from page 272

Update channels yourself: In Explorer, choose *Favorites•Manage Subscriptions.* Select the subscription you wish to update, and click the *Update* icon—or the *Update All* icon to get the latest information from all your channels.

HELP FOR TRAVELING MODEMS



IS THERE ANY WAY to connect my modem to the phone line in a motel room? Any device I could buy that would let me do this? My husband, an electrician, says he could dismantle the standard phone attachment, wire up the modem so I can use it, and then reassemble the standard connection before we depart. This sounds illegal and very bothersome. We are planning a trip and can't afford to stay at the executive suites that offer office services and plug-ins. Thanks for any info you can provide.

Susan K. Troup
St. Petersburg, Pennsylvania

REWIRING A HOTEL phone to plug in your modem was illegal in the old days of the AT&T monopoly, but not anymore. It *is* bothersome, though. A more convenient solution is to pack an acoustic coupler—a device that looks like a telephone handset for your modem. You strap the hotel's telephone handset into the coupler, and the modem transmits through it. These bulky gadgets are expensive (about $150) and require batteries, so they aren't a staple of most connected travelers (hard-core itinerant geeks usually pack an arsenal of jack adapters, alligator clips, and other implements for tearing apart a hotel room phone jack). But couplers are easy to use, and you can even connect your modem to the hotel pay phone with one—often a cheaper arrangement than dialing out from your room. One such product is Road Warrior's Telecoupler II.

If you're tempted to plug your modem directly into a hotel-room phone jack, be aware of the risk involved: If the line turns out to be digital (as opposed to analog, like the ones in your home), its voltage can destroy your modem—especially if you use a PC Card modem. That's why it's a good idea to pack a line tester. The alternative is to gamble the health of your modem on the word of the bored clerk at the front desk. A popular tester is IBM's Modem Saver. If the line turns out to be digital, you'll have to patch in either an acoustic coupler or a digital line connector, which you can hook between the base and the handset cord, before plugging your modem into the wall safely.

If you're planning a trip abroad with your modem, visit Steve Kropla's Help for World Travelers Web site (www.kropla.com/phones.htm, see **FIGURE 2**). Steve tells you all about dial tones, phone jacks, electrical plugs, and voltage to plug your laptop into outlets anywhere in the world. He offers links to retailers on the Web who sell the hardware.

Magellan's (www.magellans.com) has information for world travelers, as does LaptopTravel (www.laptoptravel.com), which offers essential tips and products (power converters, phone adapters, security tools). Frequent wayfarers may also wish to check out RoadNews (www.roadnews.com) and sign up for its free e-mail newsletter.

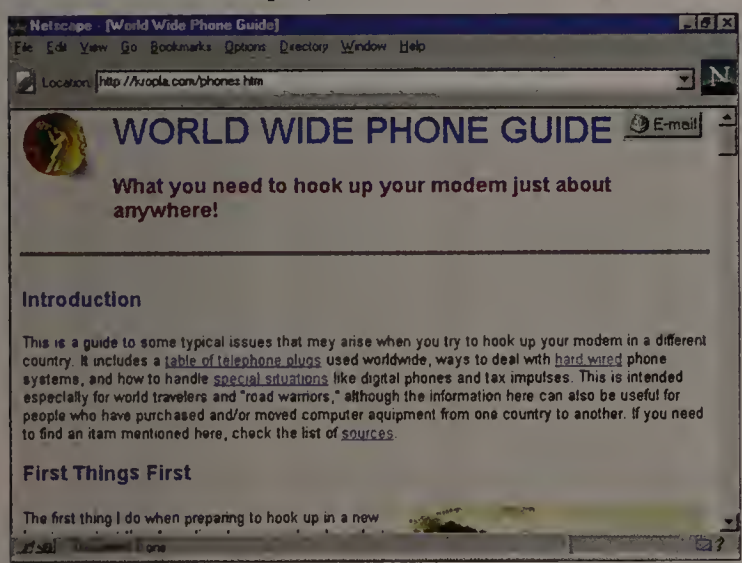


FIGURE 2: TRAVELING? STEVE KROPLA'S site tells you how to plug in anywhere in the world—and what hardware you need.

REPLY TO...OOPS

THIS EVER HAPPEN in your office? Mary e-mails a memo to everyone in the company. Moe responds with a self-incriminating reply, intended only for Mary, that also goes out to everyone in the company.

Everyone knows not to hit Reply to All indiscriminately, but many people ignore the danger lurking in the innocent-looking Reply button: In many e-mail clients, the author of the original message can easily designate a mailing list as the reply-to address. This technique is commonly used by mass-marketers and other spammers to shield themselves from angry replies from individuals who want to be removed from the mailing list or who call the senders unsavory names. The solution is simple. Whenever you click *Reply* to answer a message, always pause and take a close look at the e-mail address that pops up after 'To:' in your message header. If you see multiple names or what appears to be the name of a mailing list rather than a person's name, don't click that Send button unless you're willing to endure the consequences.

Pegasus Tells You What Mail's Waiting for You

IN RESPONSE TO Jerry Hale's query about e-mail programs that enable you to find out what mail's waiting for you on your ISP prior to downloading it (see "Email 97 Handles Multiple Accounts," June, page 300), several readers recommended David Harris's Pegasus Mail. The newest version, available from PC World Online (www.fileworld.com), lets you check mail headers and delete unwanted messages before you download. Pegasus is a terrific e-mail program—better than either Netscape's Messenger or Microsoft's Outlook Express—and it's free.

Find files from this article on PC World Online at www.fileworld.com. Internet Tips *welcomes your questions and tips and pays $50 for published items. Contributing Editor Judy Heim is coauthor of* The Quilter's Computer Companion *(No Starch Press, 1997). See page 14 for contact information.* ■

Telecoupler II
$150 list; Road Warrior; 800/274-4277; www.warrior.com

INFONET NO. 603

IBM Modem Saver
$25 list; part 73G5395 (you need this to order); IBM Parts Center; 800/388-7080; www.direct.ibm.com/parts

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The Power Computing Grand Prize Giveaway Consumer Disclosure: One prize valued at $25,000 (winner's choice of cash or merchandise) will be awarded by random drawing from among all qualified entries received. Odds of winning depend on number of entries received. Est. distribution: 25 million.

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Prizes not transferable. Prize substitution may be necessary due to unavailability, then one of equal or greater value will be awarded. Taxes on prizes & any expenses not specified in this offer are winners' responsibility. Travel companions must complete a liability release prior to departure. Minors must be accompanied by an adult. For a vehicle prize, winner is responsible for title, tags, license & registration fees, must have a valid driver's license & provide evidence of insurance at time prize is awarded. Acceptance of prize constitutes permission (except where prohibited by law) to use each winner's name, prize won, hometown & likeness for promotional purposes without further compensation.

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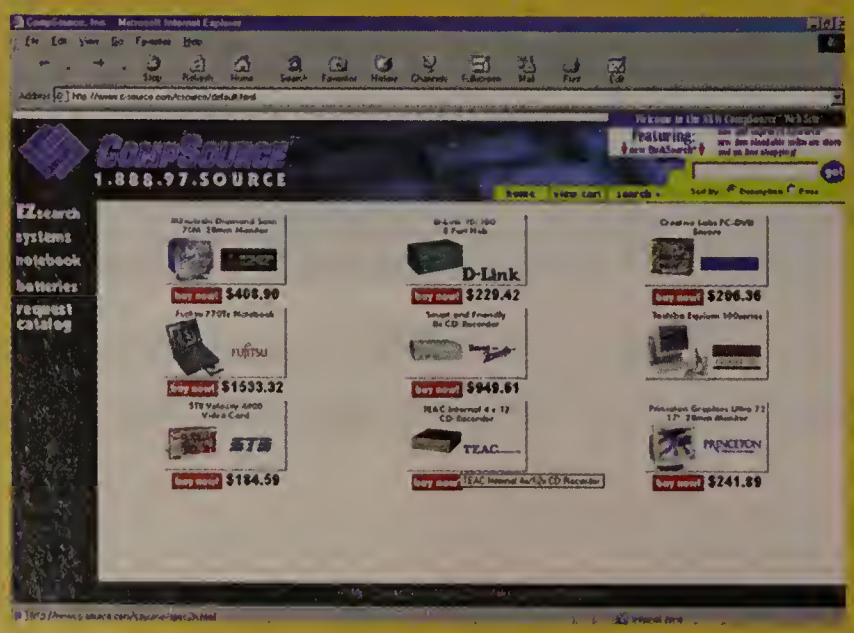

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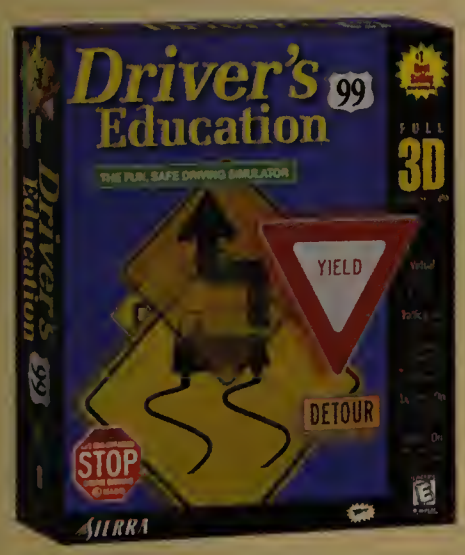

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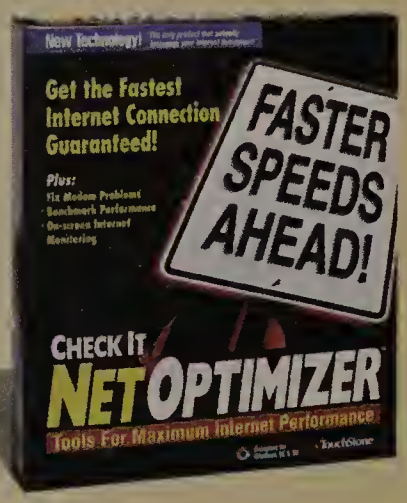

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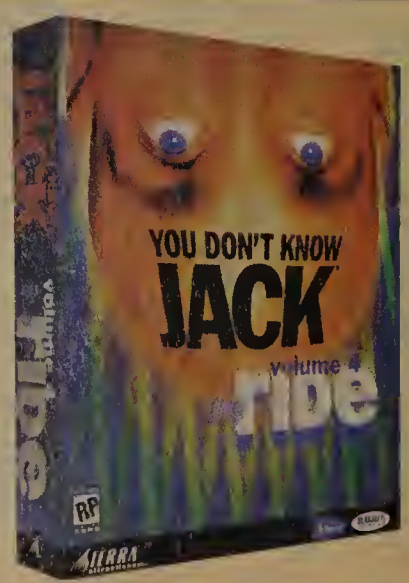

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Work With (or Without) Automatic Hyperlinks

WORD 97 AND WORDPERFECT 8 both create an automatic hyperlink when you type a URL or e-mail address into a document. Unfortunately, editing those hyperlinks is tricky because linking to them just takes you to a Web browser or an e-mail program, respectively. Here are several methods for working with automatic hyperlinks, including a much-needed way to turn them off altogether.

WORD 97

• TO EDIT THE hyperlink's text (that is, the text displayed as a hyperlink—normally blue and underlined—not the URL itself), **<Ctrl>**-click within the URL. You can then edit the URL or e-mail address as you would any other text.

• To apply formatting changes, select the hyperlink with the mouse or click immediately to the right of the URL text; then press **<Shift>-<Left Arrow>**. Thereafter, you can apply any formatting needed.

• To edit the URL or e-mail address, right-click the hyperlink and select *Hyperlink•Edit Hyperlink*. Change the text in the 'Link to file or URL' field in the Edit Hyperlink dialog box, and click *OK*. If the onscreen text is the same as the URL, it will change, too.

• To remove the link, leaving only the text, begin by right-clicking the hyperlink and selecting *Hyperlink•Edit Hyperlink*. Then, once you are in the Edit Hyperlink dialog box, click *Remove Link*.

• You can remove the link immediately after typing the URL or e-mail address by pressing **<Ctrl>-<Z>** as soon as the address you type becomes a hyperlink (which usually occurs the moment you type a punctuation mark or a space or press <Enter>).

• If you'd rather not have this automatic hyperlink feature enabled, select *Tools•AutoCorrect*, click the *AutoFormat As You Type* tab, and uncheck *Internet and network paths with hyperlinks*.

• To create a hyperlink using any text in a document, select the text and then select *Insert•Hyperlink*. In the Insert Hyperlink dialog box, type the target URL in the 'Link to file or URL' field, and click *OK*.

WORDPERFECT 8

• TO EDIT THE hyperlink's text (that is, the text displayed as a hyperlink—normally blue and underlined—not the URL itself), right-click the text and then press **<Esc>** when the context menu appears. The cursor will stay inside the text, permitting you to make any alterations you want to the content.

• To make formatting changes in the text, click just to the right of the hyperlink text and then press **<Ctrl>-<Shift>-<Left Arrow>**. This selects the text, allowing you to apply any special formatting the content requires. Or just select the hyperlink with the mouse—but don't click anything.

• To edit the target URL or e-mail address without changing the visible text, right-click the hyperlink text and select *Edit Hyperlink*. Edit the link information in the Document/Macro field of the Hyperlink Properties dialog box. When you're done, press **<Enter>** or click *OK*.

• To remove the link and leave only the text, select *View•Reveal Codes* and then move the cursor in the Reveal Codes window until it stands just to the right of the Hypertext label at the left of the hyperlink text (see **FIGURE 1**). Then press **<Backspace>** to remove the code.

• You can remove the link immediately after typing the URL or e-mail address by pressing **<Ctrl>-<Z>** as soon as the address you type becomes a hyperlink (which usually occurs the moment you type a punctuation mark or a space or press <Enter>).

• To disable WordPerfect 8's automatic hyperlink feature, begin by selecting *Tools•Settings*; then double-click the *Environment* icon, uncheck the box next to *Activate hyperlinks on open*, click *OK*, and click *Close*. If you want to turn it back on in a particular document, select *Tools•Hyperlink*, check the box next to *Activate hyperlinks*, and click *OK*.

• To create a hyperlink using any text you have typed in a document, select the text and then select *Tools•Hyperlink*. Type ▶

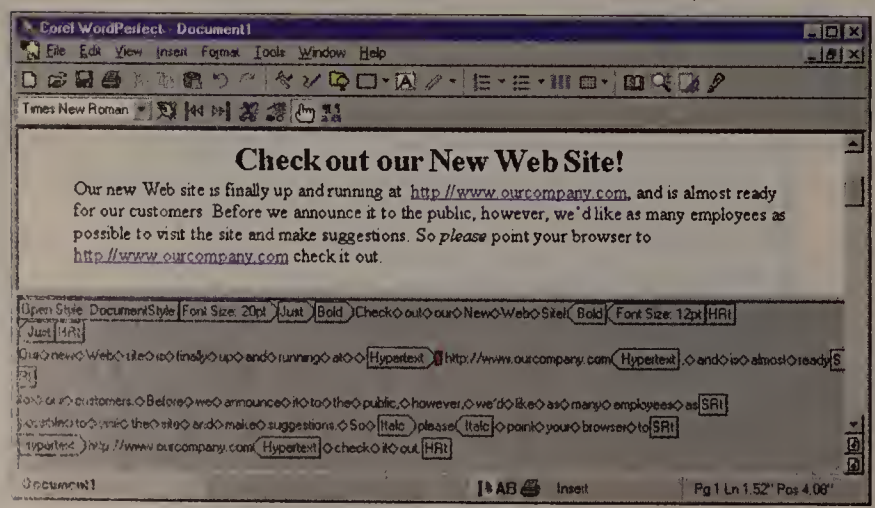

FIGURE 1: CONVERTING A URL link's text into plain text is a bit clumsy in WordPerfect, because you have to turn on Reveal Codes first.

Use Fractional Font Sizes

FEW PEOPLE KNOW that Windows word processors can use fractional font sizes. For example, if 10-point type is a bit too large and 9-point type is just too small, use 9.5-point type. This is especially useful if you're trying to squeeze or expand a block of text to fit a specific space, such as a table cell. Simply select the text you want to resize, click in the font size area of your program's toolbar, and type the fractional font size. Note: WordPerfect can handle tenths of point sizes.

ILLUSTRATION: JEFFREY PELO

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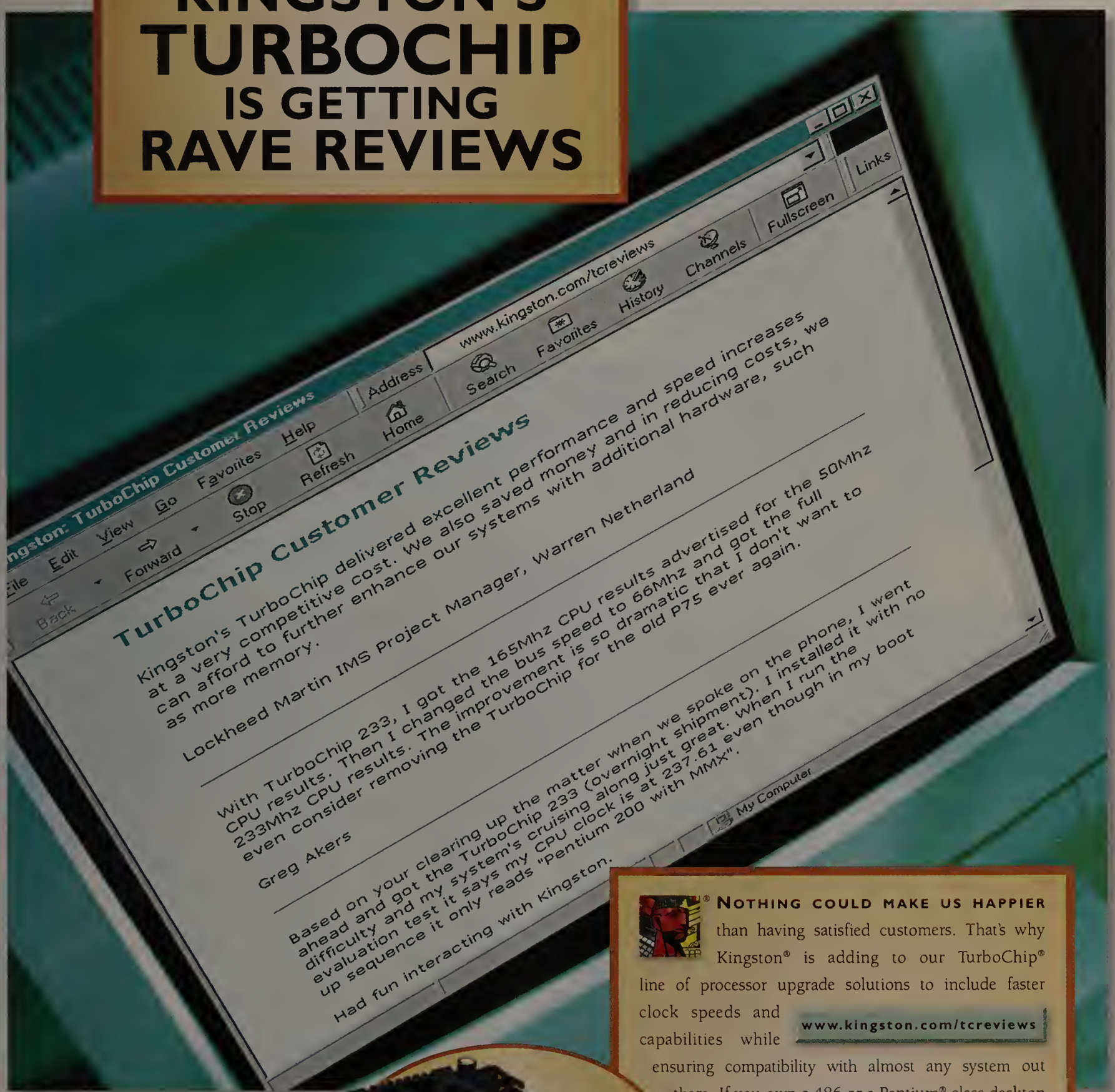

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the target URL into the Hyperlink Properties dialog box's Document/Macro field, and then click *OK* to confirm the change.

CONVERT PASSWORD-PROTECTED DOCUMENTS

IF YOU PASSWORD-PROTECT your documents and are switching word processors, don't uninstall your current program until *after* you've converted all of your documents to the new app. You'll need to use your original word processor to remove the password protection, which you can restore using your new program after you've made the conversion. Here's how to remove password protection from Word documents:

- Open the protected document, providing the password when requested.
- Select *File•Save As*.
- Inside the Save As dialog box, click the *Options* button. Then select the asterisks in the Password field of the Save Options dialog box, and press **<Delete>**. Click *OK*.
- Click *Save* in the Save As dialog box to complete the operation. **Note**: You may want to change the file name and file format at this time, converting the document to the format of your new program.
- If prompted to confirm overwriting the existing document, click *Yes*.

BETTER CROSSWORDS WITH WORD

OKAY, SO YOU'RE goofing off, doing the crosswords on your coffee break, when you find yourself stumped for a seven-letter word for a brightly colored bird. You have the first letter, "t," and the last letter, "r," and the correct answer is right there on the tip of your tongue...

Solution: As **FIGURE 2** shows, if you have Word 6.0 or later, you can get a positive ID on that "tanager" in just a few seconds and return to work. Here's how:

1. Type the unknown word as best you can, using question marks to stand for the unknown letters. For instance, in my bird clue example, you would type **t?????r**.
2. Select what you've typed, and then press **<F7>** to fire up the spelling checker.
3. Scroll through the list of suggestions until you find the word you need.

Another option, in Word 7 or later, is to right-click the word and select the best choice from the pop-up menu.

Hint: Word can't perform this trick unless you have at least the first and last letter of the word, but you can still try to find the solution by typing a test letter if the first or last letter is missing. If you still don't succeed in finding what you want, it's possible that Word's word list just doesn't contain what you're looking for.

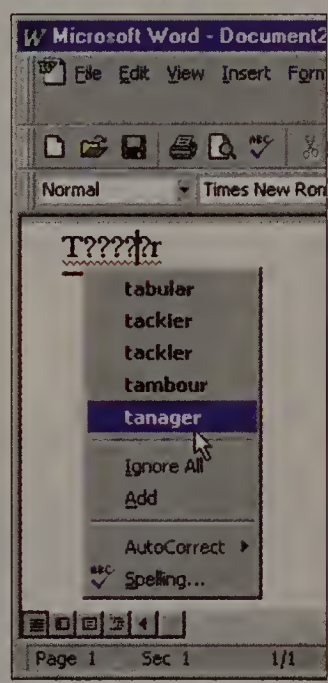

FIGURE 2: USE WORD'S SPELLING CHECKER to help fill in the blanks in your crossword puzzle.

MANAGE NUMBERED LISTS IN WORD

WHEN YOU COPY part of a numbered list in Word 7 or 97 and paste it into a new document, Word automatically renumbers the first line with a 1. To preserve the original numbering sequence of the text, follow these steps:

1. Click anywhere within the first numbered line.
2. Select *Format•Bullets and Numbering*.
3. In the Bullets and Numbering dialog box, first click the *Numbered* tab and then click either *Customize* (in Version 97) or *Modify* (in Version 7).
4. In the Customize or Modify Numbered List dialog box, change the value in the 'Start at' field to the starting number you want, and click *OK*.

Hint: You can also employ this technique when working with any numbered list, to change the starting number or to change numbering in midlist.

CHANGE MARGINS IN THE MIDDLE OF A WORD DOCUMENT

THERE'S NO GOOD way in Word 7 or 97 to preformat a document with varying margins—for instance, if only the first page of a letter needs to be laid out for your letterhead. Both versions require you to use the File•Page Setup command to insert a page break and change the margins at a specific point in the text. But if you add or delete text after inserting the break, you'll get a hard page break where you don't want one.

The best solution is to create the entire document and then add the formatting just before printing. Here's what to do:

- Select *File•Page Setup*, and set the margins for the first page of the document.
- Type all the text for the document, edit it, and apply all other formatting.
- Position the cursor at the end of the first page of the document.
- Select *File•Page Setup*. In the Apply To field, select *This point forward*. Then set the margins for this and subsequent pages, and click *OK*. If this procedure inserts an extra hard return at the beginning of page 2, delete that hard return.

If you *do* need to make changes subsequently in a document you've formatted using this technique, you can avoid a lot of problems by removing the section break before you begin editing. To do this, select *View•Normal* and then click on and delete the section break marker in the document. After making your changes, reformat the pages using the methods described earlier.

Faster Horizontal Lines in WordPerfect 8

IN "CREATE QUICK LINES in WordPerfect" (August, page 264), I described ways to draw horizontal lines quickly. But Paul Krisciunas of Orleans, Ontario, points out another quick way to create single and double horizontal lines in WordPerfect 8:

To create a single horizontal line from margin to margin, go to a blank line, type four dashes (----), and press **<Enter>**.

To create a double horizontal line from margin to margin, go to a blank line, type four equal signs (====), and press **<Enter>**.

Find more tips at www.pcworld.com/heres_how. Word Processing *welcomes your questions and tips and pays $50 for published items. Contributing Editor George Campbell is a contributor to* The PC Bible *(Peachpit Press, 1995). See page 14 for contact information.* ■

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Countless Methods for Counting With Excel

USERS ARE CONSTANTLY searching for ways to tally certain types of entries in a range or across several ranges, so I'm devoting this month's column to Excel counting techniques. See the table below for a summary of methods, and visit PC World Online (www.pcworld.com/heres_how) for more tips.

CONDITIONAL COUNTING

THE COUNT, counta, and countblank functions are straightforward, so I'll go directly to the more complex countif. This function takes two arguments: the range that holds the data to be counted, and the criterion used to determine whether a cell should be included in the count.

The examples below demonstrate various uses for the countif function. They assume that you have a range named *data*. Also, note that the second argument for the countif function can refer to a cell that contains the search criterion.

To count the number of cells that contain the value 12, enter **=countif(data,12)**.

To tally the number of cells containing 1 or 12, type **=countif(data,1)+countif(data,12)**.

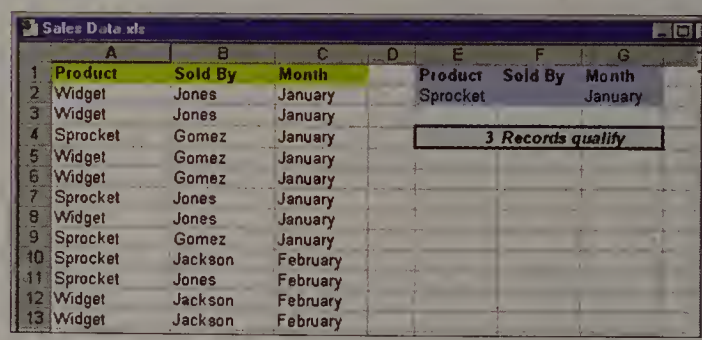
To count the number of cells that contain a value from 1 to 10, use **=countif(data,">=1")-countif(data,"<=10")**.

To count the number of cells containing a certain word—say, *yes*—type **=countif(data,"yes")**.

Finally, if you want to tally the number of cells containing any text, use **=countif(data,"*")**.

ENUMERATING WITH DATA

COUNTIF IS USEFUL when you have a single criterion. For more complex comparisons, you may want to use dcount.



	A	B	C	D	E	F	G
1	Product	Sold By	Month		Product	Sold By	Month
2	Widget	Jones	January		Sprocket		January
3	Widget	Jones	January				
4	Sprocket	Gomez	January		3 Records qualify		
5	Widget	Gomez	January				
6	Widget	Gomez	January				
7	Sprocket	Jones	January				
8	Widget	Jones	January				
9	Sprocket	Gomez	January				
10	Sprocket	Jackson	February				
11	Sprocket	Jones	February				
12	Widget	Jackson	February				
13	Widget	Jackson	February				

FIGURE 1: COMPLEX COUNTING requires complex formulas, such as dcount, which tallies records in a database.

This function requires that your data be set up as an Excel database (with field names in the first row), and that a separate criteria range specify the conditions.

FIGURE 1 shows an example of a simple database in A1:C13 and a criteria range in E1:G2. The formula in cell E4, which returns the number of sprockets sold in January, is **=dcount(A1:C18,,E1:G2)**.

The formula will yield a different value whenever you change the values in the criteria range. Also, the criteria range can handle logical "or" operations when you use additional rows.

SMARTER COUNTING WITH ARRAYS

IF NONE OF THE standard techniques fit the bill, construct an array formula, which lets you work with multiple cells in a range. To create an array formula, press **<Ctrl>-<Shift>-<Enter>** after typing the formula.

To tally the number of values in a range, enter **=sum(if(isnumber(data),1,0))**.

To count the number of cells that contain an error, try **=sum(if(iserr(data),1,0))**.

PIVOT TABLES

THE ULTIMATE IN counting tools, a pivot table lets you summarize data in just about any way. Select *Data•PivotTable* to start the PivotTable Wizard.

Visit PC World Online at www.pcworld.com/heres_how for more Excel counting tips. Spreadsheets *welcomes your questions and tips and pays $50 for published items. Contributing Editor John Walkenbach is the author of nearly two dozen books and The Spreadsheet Page (www.j-walk.com).* *See page 14 for contact information.* ■

How Many Days in the Month?

EXCEL LACKS a function for calculating the number of days in a particular month, so you'll need to construct your own formula. If cell A1 contains a date, this formula will return the number of days in the month: **=day(date(year(A1),month(A1)+1,1)-1)**.

1-2-3's @dateinfo function is more helpful. The second argument for this function determines the type of information to return about a date (oddly enough, '7' yields the number of days in the month). This formula refers to a date in cell A1: **@dateinfo(A1,7)**.

COUNT ON IT: EXCEL COUNTING METHODS

FUNCTION		What it does
Count		Counts the number of cells in a range that contain numeric values.
Counta		Counts the number of nonempty cells in a range.
Countblank		Counts the number of empty cells in a range.
Countif		Counts the number of nonempty cells in a range that meet a specified criterion.
Subtotal		Performs various calculations (including counts) only on the visible cells in a range.
Dcount		Within a list or database, counts the number of cells that contain numeric values that meet specified criteria.
Other techniques	Array formula	Performs multiple calculations (useful when the other techniques won't work).
	Pivot table	Summarizes large amounts of data in various ways.

ILLUSTRATION: JEFFREY PELO

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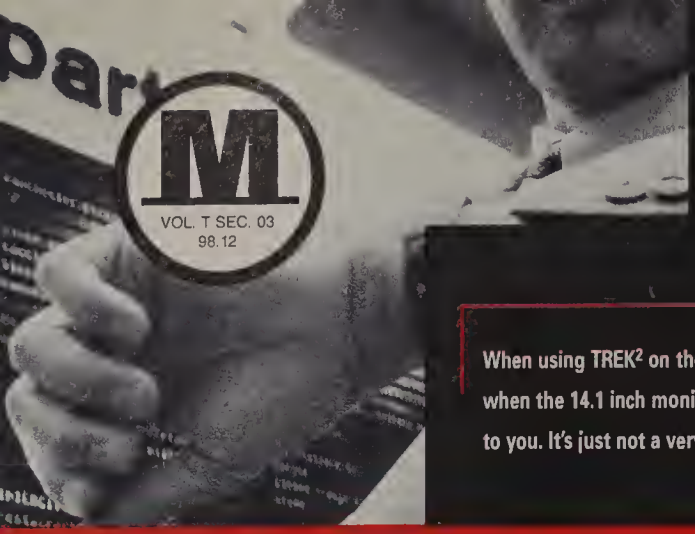

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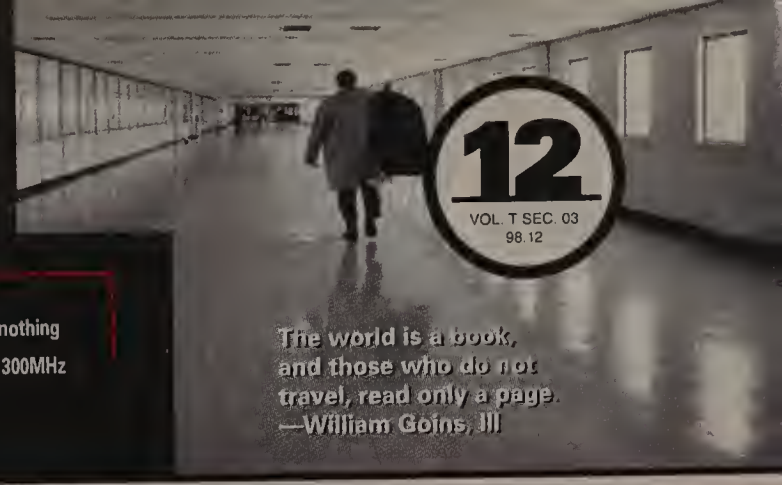

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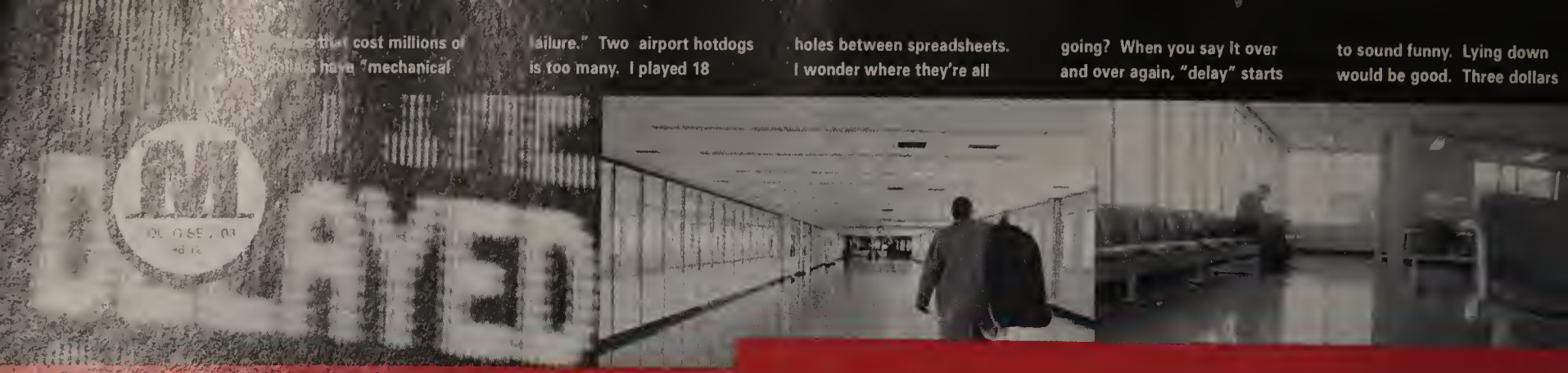

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is a lot for water. Solitaire is actually pretty fun for about a minute. That person looks like somebody I know. I'm actually excited about the prospect of getting on a plane. Why isn't my cell phone working? That kid keeps staring at my GoBook. This is better than being in the office, I guess. What's that smell?

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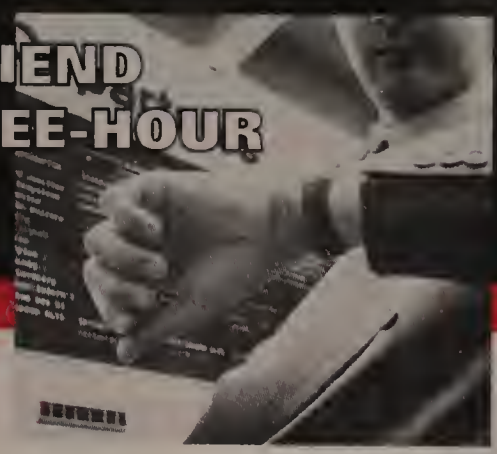

12
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"It's not enough to be busy. The question is: What are we busy about?" —Henry David Thoreau

"The GoBook outperformed every other machine in our review by a sizable margin" *CNET*, Editors' Choice, Best UltraPortable Reviewed, May '98

Here's the GoBook difference: Featuring the fastest Intel Pentium and Pentium II processors • Preloaded with Microsoft's Windows 98 • Includes a big active matrix 12.1" SVGA display powered by 128-bit graphics accelerator • A revolutionary modular battery design that performs as well traveling across town as it does across the Atlantic Ocean • Big room for expandability: The GoBook includes both a 24X CD-ROM drive and a 3.5" floppy drive • All in a super thin and light package that starts at just 1.35" thin and 4.4lbs.*

intel inside pentium® II PROCESSOR

Micron's Award-Winning GoBook Now Starts at Just $1,799

Model Name	GoBook™ 233	GoBook² 266	New! GoBook² 300
Processor	Intel® Pentium® processor with MMX™ technology 233MHz	Intel Pentium II processor 266MHz	Intel Pentium II processor 300MHz
Cache	512KB L2 pipeline burst cache	512KB L2 pipeline burst cache	512KB L2 pipeline burst cache
RAM	64MB EDO DRAM	32MB EDO DRAM	32MB EDO DRAM
Hard Drive	3.2GB hard drive❖	3.2GB hard drive❖	3.2GB hard drive❖
Monitor	12.1" SVGA display	12.1" SVGA display	12.1" SVGA display
CD-ROM	24X CD-ROM drive	24X CD-ROM drive	24X modular CD-ROM drive
Graphics	2MB/128-bit graphics accelerator	2MB/128-bit graphics accelerator	2MB/128-bit graphics accelerator
Sound System	16-bit stereo/Wavetable sound	16-bit stereo/Wavetable sound	16-bit stereo/Wavetable sound
Warranty	5-year/1-year Micron limited warranty	5-year/1-year Micron limited warranty	5-year/1-year Micron limited warranty
Software Included	Microsoft® Windows® 98 System Wizard Mobile Client†††† Norton AntiVirus	Microsoft Windows 98 System Wizard Mobile Client†††† Norton AntiVirus	Microsoft Windows 98 System Wizard Mobile Client†††† Norton AntiVirus
Also Includes:	Bay battery 4.4lbs (w/floppy drive)* 6.7lbs (w/opt./base battery & floppy) USB, parallel, serial, VGA, PS/2, NTSC/S-Video ports MPEG compatible CardBus/Zoomed Video ready Microphone, stereo line-in/out jacks 2 Type II/1 Type III PCMCIA slots 2-way infrared port Touchpad pointing device 3.5" modular floppy drive • Add SuperBase Battery for $299	Bay battery 4.4lbs (w/floppy drive)* 6.7lbs (w/opt./base battery & floppy) USB, parallel, serial, VGA, PS/2, NTSC/S-Video ports MPEG compatible CardBus/Zoomed Video ready Microphone, stereo line-in/out jacks 2 Type II/1 Type III PCMCIA slots 2-way infrared port Touchpad pointing device 3.5" modular floppy drive • Add SuperBase Battery for $299	Bay battery 4.4lbs (w/floppy drive)* 6.7lbs (w/opt./base battery & floppy) USB, parallel, serial, VGA, PS/2, NTSC/S-Video ports MPEG compatible CardBus/Zoomed Video ready Microphone, stereo line-in/out jacks 2 Type II/1 Type III PCMCIA slots 2-way infrared port Touchpad pointing device 3.5" modular floppy drive • Add SuperBase Battery for $299
Price	$1,799 $63/mo. TechRefresh Bus. Lease, 36 mos.** New Low Price!	$1,999 $70/mo. TechRefresh Bus. Lease, 36 mos.**	$2,899 $101/mo. TechRefresh Bus. Lease, 36 mos.**

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1 Clocked at speeds over 60mph, the cheetah is the fastest land animal. This "big cat" hunts mainly gazelle, but the average chase lasts only about 20 seconds.

2 In early October 1998, *PC World* Magazine ranks the Micron Millennia the #1 Power Desktop on the market calling it "the fastest of all" systems tested.

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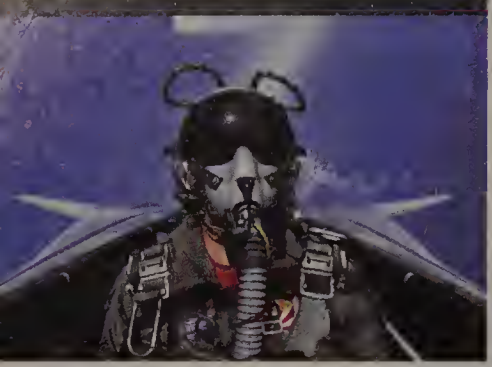
Defense Contractor



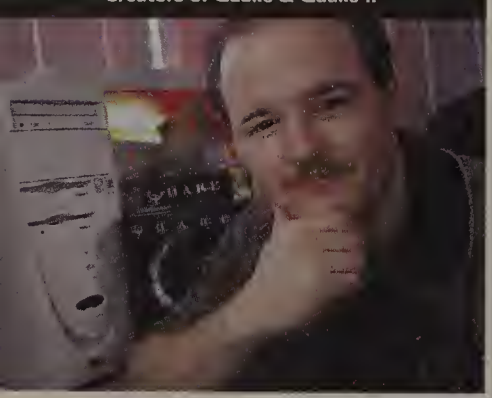
Micron Systems:
Over 100,000 deployed Micron desktops, notebooks & servers

Favorite Feature:
Price/power ratio

Purpose:
Help maintain US security and freedom

For The Whole Story: www.micronpc.com

Tim Willits
Lead Map Designer, id Software
Creators of Quake & Quake II



Micron Systems:
Micron Millennia 400 desktops

Favorite Feature:
400MHz - Of course

Purpose:
Test mind-bending levels of Quake II and help create one of the coolest games ever

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Sept '98

PC WORLD BEST BUY
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PC WORLD BEST BUY
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Just named #1 450MHz desktop by the editors of *CNET* and #1 Power Desktop by the editors of *PC World* Magazine (Millennia 400 DVD • October '98, Millennia MAX 450 • *PC World* "Best Buy" November '98), Micron's Millennia desktop product line continues a long tradition of industry-leading, award-winning performance. Perhaps that's why some of the most prominent power users around rely on Micron. No matter how strenuous your demands, no matter how colossal the task, we invite you to put a Millennia® desktop to the test. You'll be hard-pressed to find a Pentium® II processor based system as powerful and affordable as the Micron™ Millennia. And Micron's revolutionary new MPower℠ purchase program makes Millennia ownership even easier, offering qualified users no interest or payments for six months as well as PowerXchange℠ trade-in options on your current Pentium processor-class PC towards a new Millennia desktop.

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TechRefresh lease prices are based on a 36-month lease and are available to business customers. Businesses can qualify for 60-day same-as-cash and individuals for 6-month same-as-cash programs. If purchase advance and related charges are not paid in full within 60 days from purchase date for business or within 180 days from purchase date for individuals, finance charges will be assessed from purchase date. APR varies and is 17.65% as of 8/25/98 with a minimum finance charge of $1.00. Term financing is available to individuals for home or business use. PowerXchange accepts trade in of most major computer brands.. Please call for details and the latest qualified brand list. Cash rebates are based on the avaraga wholesale value of your PC per the Orion Blue Book, or other source chosen by Micron, adjusted for condition at trade-in.
A non-refundable up-front freight charge applies for participation in PowerXchange to cover cost of return packaging and processing.

3 The fastest typist in the world types 170 words per minute. To give you some idea of how many words that is, this little blurb is only 30 words long.

4 The newest Micron Millennia features the Intel Pentium II processor 450MHz, the fastest chip available. Don't settle for anything less.

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— RALPH WALDO EMERSON

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intel inside pentium® II PROCESSOR

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Processor	Intel® Celeron™ processor 333MHz	Intel Pentium® II processor 350MHz	Intel Pentium II processor 450MHz	Intel Pentium II processor 450MHz	Intel Pentium II processor 450MHz
Cache	128KB internal L2 cache	512KB internal L2 cache	512KB internal L2 cache	512KB internal L2 cache	512KB internal L2 cache
RAM	32MB SDRAM	64MB 100MHz SDRAM	64MB 100MHz SDRAM	128MB 100MHz SDRAM	128MB 100MHz SDRAM
Hard Drive	4.3GB Ultra ATA hard drive*	8.4GB Ultra ATA hard drive*	8.4GB Ultra ATA hard drive*	13.6GB Ultra ATA hard drive*	14.4GB 7200 RPM Ultra ATA hard drive*
Monitor	15" Micron 500Vx monitor (13.8" display)	17" Micron 700Vx monitor (15.9" display)	17" Micron 700Vx monitor (15.9" display)	17" Micron 700Vx monitor (15.9" display)	19" Micron 900Lx monitor (18" display)
DVD/CD-ROM	32X max speed CD-ROM drive	32X max speed CD-ROM drive	32X max speed CD-ROM drive	32X max speed CD-ROM drive	4.8X DVD-ROM drive
Modem	3Com/U.S. Robotics 56K WinModem**	3Com/U.S. Robotics 56K WinModem**	3Com/U.S. Robotics 56K WinModem**	3Com/U.S. Robotics 56K WinModem**	3Com/U.S. Robotics 56K WinModem**
Graphics	nVidia Riva 128, 4MB SGRAM 3D AGP graphics	nVidia Riva 128, 8MB SGRAM 3D AGP graphics	nVidia Riva 128, 8MB SGRAM 3D AGP graphics	nVidia Riva 128, 8MB SGRAM 3D AGP graphics	Diamond Viper 550 nVidia TnT, 16MB graphics
Sound System	PCI 64-voice Wavetable sound	PCI 64-voice Wavetable sound	PCI 64-voice Wavetable sound	PCI 64-voice Wavetable sound	PCI 64-voice Wavetable sound
Warranty	5-year/3-year Micron Power℠ limited warranty	5-year/3-year Micron Power limited warranty	5-year/3-year Micron Power limited warranty	5-year/3-year Micron Power limited warranty	5-year/3-year Micron Power limited warranty
Software Included	Microsoft® Windows® 98 Microsoft Home Essentials Norton AntiVirus	Microsoft Windows 98 Microsoft Office 97 Small Business Edition Microsoft Outlook Microsoft Internet Explorer Norton AntiVirus	Microsoft Windows 98 Microsoft Office 97 Small Business Edition Microsoft Outlook Microsoft Internet Explorer Norton AntiVirus	Microsoft Windows 98 Microsoft Office 97 Small Business Edition Microsoft Outlook Microsoft Internet Explorer Norton AntiVirus	Microsoft Windows 98 Microsoft Office 97 Small Business Edition Microsoft Outlook Microsoft Internet Explorer Norton AntiVirus
Also Includes:	New MicroTower℠ case Advent AV009 stereo speakers 104-key enhanced keyboard Microsoft IntelliMouse® 3.5" floppy drive	New MicroTower case Advent AV009 stereo speakers 104-key enhanced keyboard Microsoft IntelliMouse 3.5" floppy drive	New MicroTower case Advent AV009 stereo speakers 104-key enhanced keyboard Microsoft IntelliMouse 3.5" floppy drive	Micron MiniTower case Advent AV009 stereo speakers 104-key enhanced keyboard Microsoft IntelliMouse 3.5" floppy drive	Micron MiniTower case Monsoon MM1000 flat panel speakers w/subwoofer 100MB Iomega Zip Drive 104-key enhanced keyboard Microsoft IntelliMouse 3.5" floppy drive
Price	$1,249 $44/mo. TechRefresh Bus. Lease, 36 mos.**	$1,499 $52/mo. TechRefresh Bus. Lease, 36 mos.**	$1,699 New Low Price! $59/mo. TechRefresh Bus. Lease, 36 mos.**	$2,499 $87/mo. TechRefresh Bus. Lease, 36 mos.**	$2,899 New Low Price! $101/mo. TechRefresh Bus. Lease, 36 mos.**
Upgrade to:	Upgrade to: 64MB SDRAM memory 6.4GB Ultra ATA hard drive 17" Micron 700Vx monitor (15.9" display) 100MB Iomega Zip drive	Upgrade to: 128MB SDRAM memory 10GB Ultra ATA hard drive 17" Micron Trinitron 700Tx monitor (16" display) 100MB Iomega Zip drive	Upgrade to: 128MB SDRAM memory 13.6GB Ultra ATA hard drive 19" Micron 900Lx monitor (18" display) 4.8X DVD-ROM drive	Upgrade to: 100MB Iomega Zip drive Monsoon MM1000 flat panel speakers w/subwoofer 19" Micron Trinitron monitor (18" display)	Upgrade to: 256MB 100MHz SDRAM Microsoft Natural Keyboard Elite
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Better Living Through a Healthy Registry

WHEN WINDOWS 98 wants to know what kind of graphics card, hard disk, or other hardware is installed in your PC, it goes to the Registry. And if it doesn't find the answers it's looking for, it gets very upset and can instigate all kinds of problems, ranging from trivial to catastrophic. So it pays to take good care of your Registry.

Under Windows 95, maintaining and repairing the Registry is cumbersome at best. Fortunately for Windows 98 users, Registry Checker, a new utility in the OS, makes those tasks much easier.

Taking care of the Registry means watching over two files, system.dat and user.dat. Both are hidden files found in your Windows folder. They contain all the hardware, software, and user settings for your PC. If the files are damaged—due to an improper system shutdown or a hard disk problem, for example—individual applications may not work properly, or your system may crash and refuse to start.

Registry Checker optimizes these files and safeguards them against future problems. Each time you launch Win 98, the utility automatically optimizes your Registry. If it finds 500KB or more of outdated entries, it removes them, shrinking the size of those .dat files. This makes the files more convenient to back up and store, and also accelerates Win 98's launch and shutdown.

Next, Registry Checker scans the .dat files for damage. If you're lucky, it won't find any problems. And when you're faced with crashes, Registry Checker can save you hours of troubleshooting.

BACKUP BASICS

THE BEST WAY to fix a damaged Registry is to replace the current system.dat and user.dat with healthy backup copies. Before Registry Checker, keeping up-to-date backups meant manually copying those files and—if you were smart—storing them on a separate drive. Each time Windows 95 launches, it *does* store a backup copy of each of these files—called system.dao and user.dao—in the Windows directory. But these backup files are often of limited value; by the time you realize you have a serious problem, you've probably restarted Windows at least once and overwritten the good backups with damaged originals.

Registry Checker partially avoids this pitfall by making multiple backups. The first time Windows 98 launches each day, Registry Checker automatically backs up both Registry files and stores them in a single file in the Windows\Sysbckup folder. Note: If you haven't rebooted in a few days, you can still trigger an automatic backup by selecting *Start•Run*, typing **scanreg**, and then following the on-screen instructions for performing an impromptu Registry backup.

The backup files are compressed and saved as .cab files and named rb*xxx*.cab, where *xxx* is the number of the backup—001, 002, and so on. But the numbers don't correspond to the backup date. To find the most recent backup, check the modification date of the files in Explorer.

By default, Registry Checker stores only five backup copies of the Registry. With each new backup thereafter, it overwrites the oldest file. So you may feel more secure using a copy that goes back more than five days. If you wish, you *can* set the Registry Checker to create a maximum of 99 ▶

Play CDs Your Way

DON'T YOU HATE AUTOPLAY? Here are a couple easy cures. To disable the feature entirely, right-click *My Computer*, select *Properties•Device Manager*, click the plus sign next to 'CDROM', and right-click the drive you want to configure. Under *Properties•Settings*, uncheck *Auto insert notification*. If you just want to disable it for one CD, hold down the <Shift> key while you insert the disc. Or get the free AutoPlay Extend Utility which is part of Power Toys, available from PC World Online at www.fileworld.com.

TWEAK REGISTRY CHECKER TO FIT YOUR NEEDS

KEY OPTION	Action	Settings
Backup=	Runs Registry Checker at first launch of each day.	1: enabled (default); 0: disabled
Optimize=	Removes wasted space from the Registry files system.dat and user.dat each time Registry Checker runs.	1: enabled (default); 0: disabled
MaxBackupCopies=	Sets the number of sequential backup copies to be made.	5: backs up five copies (default); maximum is 99
BackupDirectory=	Determines directory where backup .cab files are stored.	default is c:\windows\sysbckup
Files=	Adds extra files to the .cab backup file.	file names with full paths separated by commas (example: c:\autoexec.bat, c:\config.sys)

FIGURE 1: USE SCANREG.INI to set the number of backups and add files to Registry Checker's automatic backup.

ILLUSTRATIONS JEFFREY PELO (TOP); JAMES YANG (BOTTOM)

FastTrack Schedule

has long provided *powerful project planning* and monitoring capabilities, and this upgrade polishes those capabilities and adds real-time collaboration tools.
PC Magazine, May 5, 1998

The latest edition improves the ***ease-of-use and power*** *of existing functions like setting up schedules,* allocating resources, calculating cash flow. . . .
Fortune, Technology Buyer's Guide, Winter 1998

...easy to learn and use, **and offers considerable *control* over even the most complex undertakings.**
PC Computing, May, 1998

The program's **Strength** *lies in its flexible layout and presentation tools.*
Info World, April 6, 1998

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PC Week, March 18, 1998

We couldn't have said it better ourselves.

The experts agree. FastTrack Schedule 5.02 is the right choice for easy project scheduling — enabling you to create presentation quality schedules quickly and easily. Here are some of the ***NEW*** features found in version 5.02:

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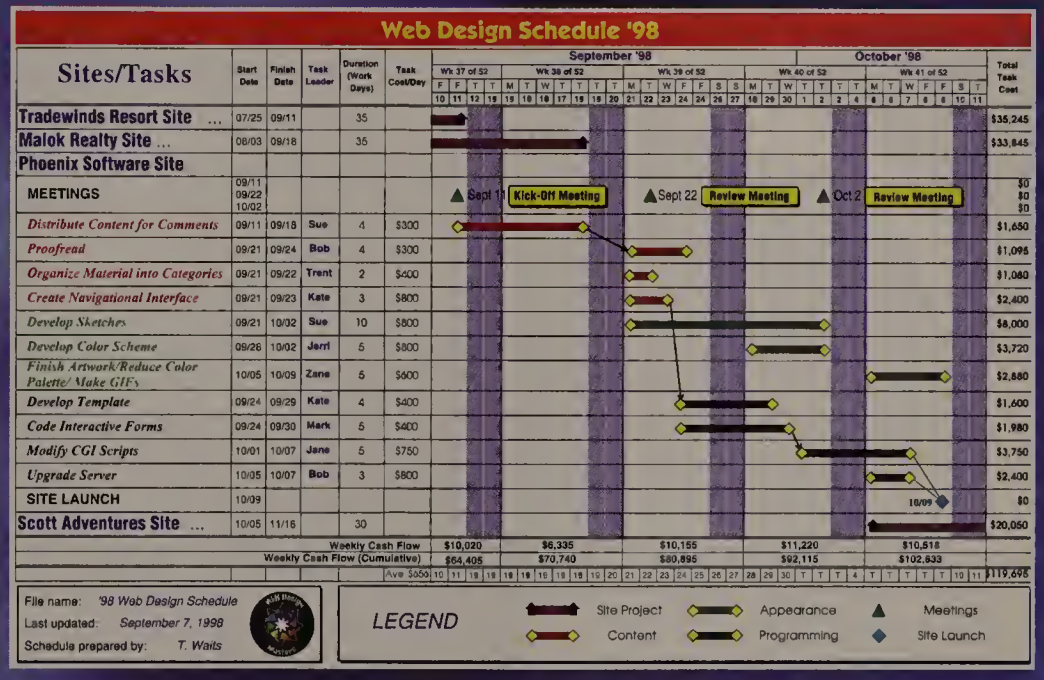
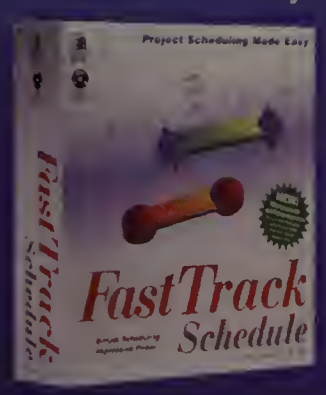


Why waste time struggling with complicated and costly project management programs? FastTrack Schedule 5.02 is easy-to-use, intuitive, and extremely flexible. It's available for Windows 3.1x, Windows NT 4.0, Windows 95, and Macintosh. And because it's also fully Windows 98 compatible, everyone in your office can stay on schedule today and into the 21st century. So whether you need to plan a day's worth of activities or a year's worth of projects, you'll stay on schedule and achieve project goals with FastTrack Schedule.



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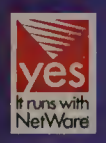

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backup copies. Click the *Start* button, select *Run*, and type **scanreg.ini**. This will open the file in Notepad. Look for and edit the line that says 'MaxBackupCopies=*x*', save, and close. (Other Registry Checker settings are also found here; see **FIGURE 1**.)

But more isn't always better. For every five compressed Registry .cab files, expect to sacrifice 2MB to 5MB of disk space. I recommend keeping the default at five backups—that's enough to protect you from most Registry emergencies.

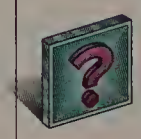
It may take longer than five days—or five backups—to discover a Registry-related problem. My solution: Supplement Registry Checker's backups with selective manual backups immediately before *and* after you install any new hardware or software. The reason for a preinstallation backup file is obvious, but a postinstallation backup file is just as important. If a problem arises weeks after the installation and *isn't* caused by the recently installed hardware or software—but rather by a disk problem or random software conflict, for example—the postinstallation backup file can get you up and running without the hassle of a reinstallation.

To manually back up the Registry with Registry Checker, use *Start•Run*, type **regscan.exe**, and select *Yes* when prompted to make a backup. This will create a .cab file as described above. To prevent this file from being overwritten, rename it with the name of the hardware or software you're installing and either "before" or "after" (for example, sblaster_before.cab or AOL_after.cab).

By default, Registry Checker places four files in a .cab file: system.dat, user.dat, system.ini, and win.ini. (The latter two files are vestiges of Windows 3.1, retained for compatibility with older software that looks to those specific files for configuration data.) If you want to add other files, for example, autoexec.bat and config.sys, place their names and locations under the 'Files=' entry in scanreg.ini (see Figure 1). Registry Checker comes in two flavors, Windows (scanregw.exe) and DOS (scanreg.exe). Each has its own capabilities (see **FIGURE 2**). If you want to restore a Registry backup or make backups from DOS, you have to do so with scanreg. And you have to start scanreg.exe from a DOS prompt in MS DOS mode—get there via *Start•Shut Down•Restart in MS-DOS mode*. If you try to run scanreg.exe in Windows, you'll get scanregw.exe instead.

In scanreg.exe select *Start•View Backups*. You'll see a list of the current backup files with creation dates. Select a file, and Registry Checker will restore it. But scanreg.exe sees—and lets you restore—only files whose names fit the rb*xxx*.cab format. To restore files you've saved with nonstandard names, open Explorer, find the .cab file you want to restore, and double-click it. You'll see the files stored in that .cab; just copy the files you want to restore over the originals, and reboot.

PII FAN CLUB



I'VE BEEN constructing a new computer and need a cooling fan for my Pentium II CPU. I've seen some really cheap fans in the local computer shop, but I'm worried about their quality. Can you recommend a CPU fan and offer any installation tips?

Byron Gully, Jr., Chicago

INSTALLING A BUDGET cooling fan is asking for trouble. Pentium IIs, especially, generate a lot of heat and must be efficiently cooled. If the fan fails, the CPU can overheat and trash your system.

I recommend the $21 CPU-Cool K1 from PC Power & Cooling. It's a first-rate fan and an excellent investment. If you do buy a no-name fan, make sure it has ball bearings, not sleeve bearings. The quick way to tell is to spin the fan blades and watch them come to a stop. A jerky stop—as if the blades are aligning with a magnetic field—indicates a high-quality fan with ball bearings.

The fan and heat sink should come with a thermal adhesive for attaching the fan to the CPU. Attaching a fan and heat sink with the special Rivscrews that you see on OEM Pentium II CPUs requires a special $400 tool, so you're probably better off paying a technician to do it for you. But if you're replacing an OEM fan and heat sink that are already attached with Rivscrews, you can remove them with a 5/64-inch hex wrench.

Make sure your motherboard and BIOS support the tach output of your make of fan. This feature monitors the fan's RPM and tells you if the fan has failed or slowed down; it's supposed to be standard on Pentium II motherboards, but not all motherboards support all fans. To be safe, get a heat alarm like PC Power & Cooling's 110 Alert. It's only $17, mounts easily in your PC, and sounds an alarm when the internal case temperature exceeds 100 degrees.

SCANREG REPAIRS, RESTORES

FEATURE	DOS	Windows
Creates backup of Registry files	●	●
Launch command	scanreg	scanregw
Repairs corrupted Registry	●	○
Restores Registry from backup	●	○
Runs automatically	only if damaged file is detected	on each Windows launch
Runs in safe mode	○	●
Scans Registry for damage	●	●

● Yes ○ No

FIGURE 2: REGISTRY CHECKER works best if you back up Registry files using the Windows version and restore them with the DOS version.

Find files from this article at PC World Online's FileWorld (www.fileworld.com). For more hardware tips, visit www.pcworld.com/heres_how. Kirk Steers is a PC World *contributing editor.* Hardware Tips *welcomes tips and questions and pays $50 for published items. See page 14 for contact information.* ■

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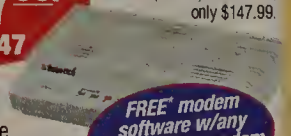

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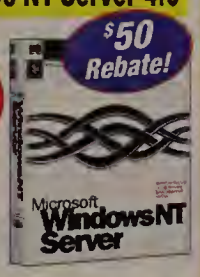

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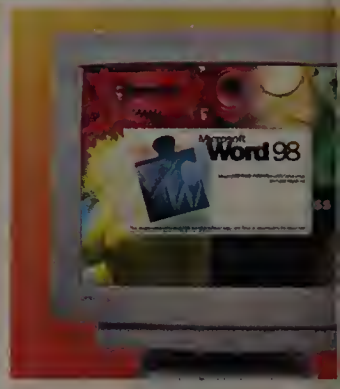

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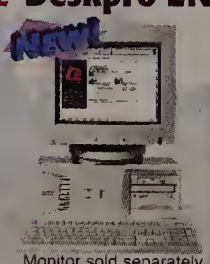
450/PII 128MB DVD 2296.00

COMPAQ Deskpro EN



✦ 300MHz Intel Celeron™ processor ✦ 128KB Level 2 cache ✦ 32MB SDRAM standard ✦ 3.2GB hard drive ✦ 1.44MB floppy disk drive ✦ 10/100 Ethernet adapter ✦ Windows® 95 ✦ 3-year limited parts and labor

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PC 300PL Series desktops
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350/PII 32MB 4.2GB 10/100 Win 98 ..... 1479.40
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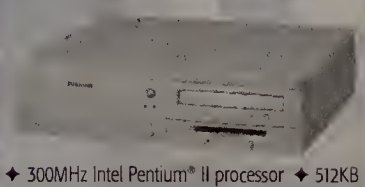
400/PII 64MB 6.4GB 32X 10/100 NT 1938.55
450/PII 64MB 6.4GB 32X 10/100 NT 2238.46

TOSHIBA Equium 7000D



✦ 300MHz Intel Pentium® II processor ✦ 512KB Level 2 cache ✦ 32MB RAM standard ✦ 4GB hard drive ✦ 24X CD-ROM drive ✦ Windows® 95

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330CDT 266/MMX 32MB 4GB 12.1" AM 20X 1727.36
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Tecra notebooks
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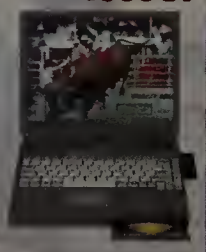

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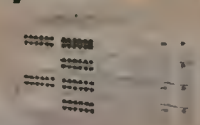

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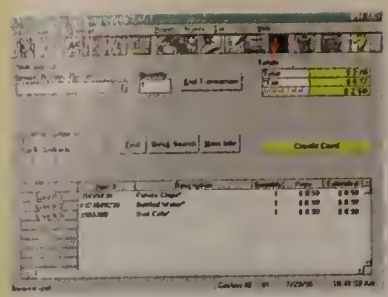

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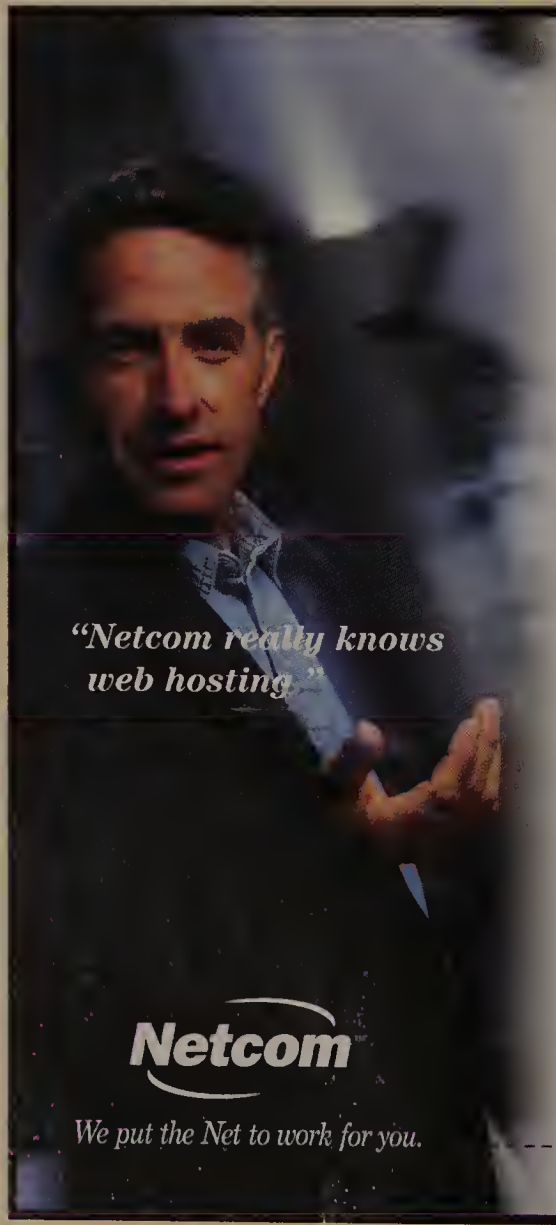

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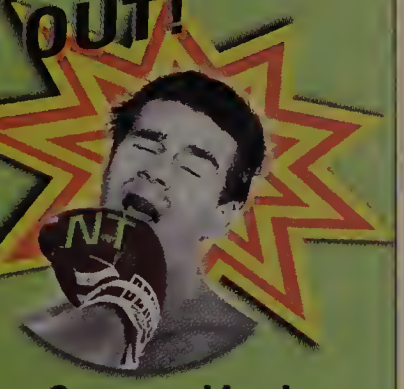

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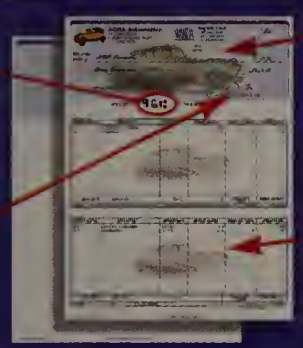

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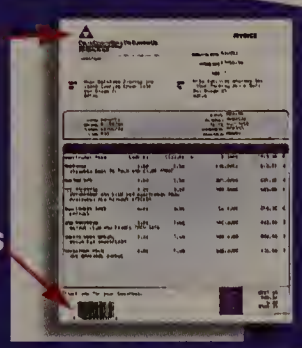

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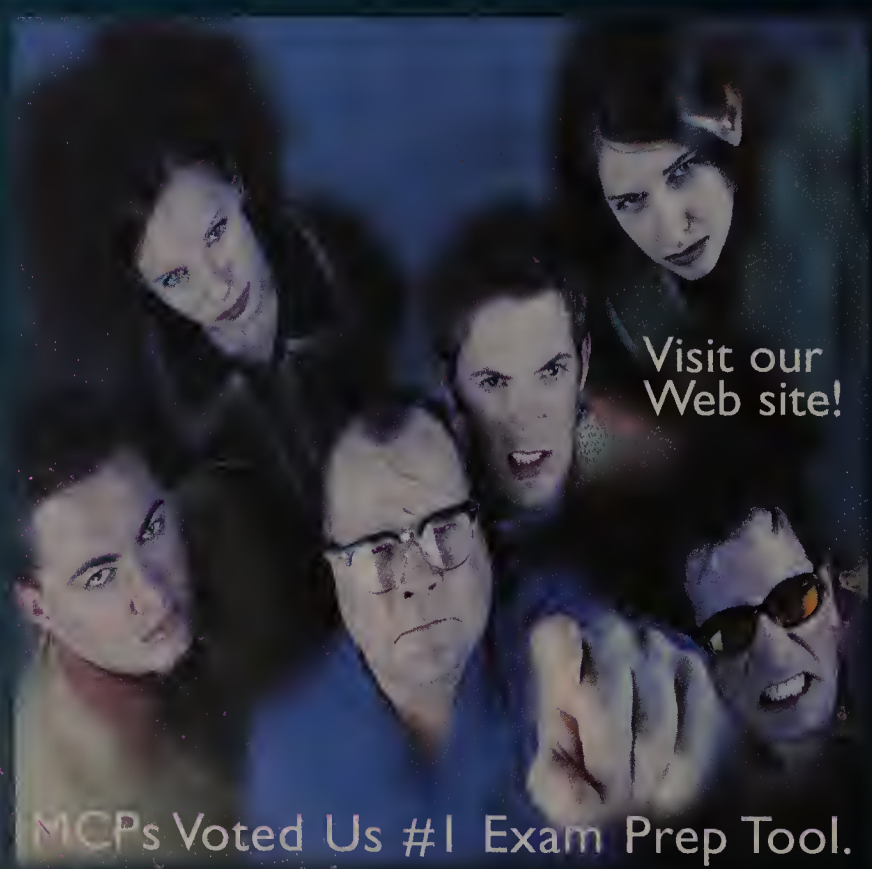

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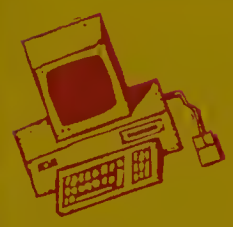

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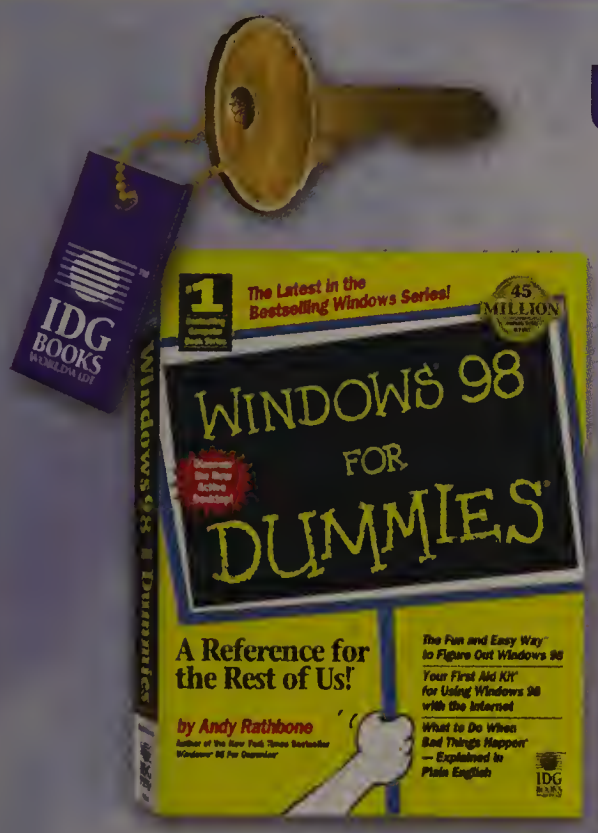

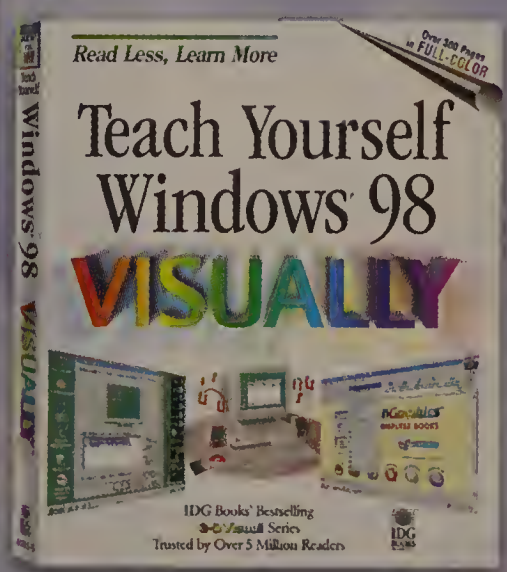

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DIMMS (168 pin)

SDRAM - 66MHZ, 100MHZ, 133MHZ, 10ns, 8ns	x64	x72 ECC	PC-100	PC-100 ECC	CAS LATENCY 2 PC-100	CAS LATENCY 2 PC-100
8Meg	—	—	—	—	64 Bit	72 Bit ECC
16Meg	29	—	39	49	Non-Reg. / Registered	
32Meg	48	59	49	64	—	—
64Meg	108	129	109	128	129 / 149	129 / 149
128Meg	198	239	209	249	279 / 299	279 / 299
256Meg	579	619	699	799	659 / 799	659 / 799

INDUSTRY STANDARD DIMMS

Unbuffered	16Mg	32Mg	64Mg	128Mg	256Mg
3.3V ECC, EDO	44	74	119	259	—
3.3V EDO	34	59	109	249	—
Buffered					
3.3V ECC, EDO	44	74	119	259	569

72 PIN SIMMS (FPM, EDO)

	60NS	70NS	60NS
1 x 32 4 mg	8	8	8
2 x 32 8 mg	15	15	15
4 x 32 16 mg	25	25	–
8 x 32 32 mg	46	46	–
16 x 32 64 mg	119	119	–
1 x 32 4 mg EOO	10	10	–
2 x 32 8 mg EOO	14	14	–
4 x 32 16 mg EDO	22	22	–
8 x 32 32 mg EDO	45	45	–
16x32 64 mg EOO	119	119	–

	60NS	70NS	60NS
256 x 36	–	14	14
512 x 36	–	3	–
256 x 32	–	3	–
512 x 32	–	4	–
1 x 36 4 mg	14	14	14
2 x 36 8 mg	25	25	25
4 x 36 16 mg	34	34	–
8 x 36 32 mg	59	59	–
16 x 36 64 mg	169	169	–

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SIMM MODULES

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1Meg x 3 (3 chip)	4.00	4.00	4.00
1Meg x 9 (9 chip)	4.00	4.00	4.00
4Meg x 3 (3 chip)	12.00	12.00	–
4Meg x 9 (9 chip)	14.00	14.00	14.00
16Meg x 9 (9 chip)	59.00	59.00	–

DELL MEMORY

Dimension XPS M166S, M2090, P133s, 166s, 200s, P133v, 166v, 200v (SDRAM)	18Meg/32Meg	29/49
Dimension XPS P60, P75, P90, P100 (pairs)	4Meg/8Meg/16Meg/32Meg	9/19/29/49
Dimension XPS P100c, 120c, 133c, 166c, XPS P75T, 100T (pairs) FPM or EDD	4Meg/8Meg/18Meg/32Meg	9/19/29/49
Dimension XPS Pro 150, Pro 200 (quads)	4Meg/8Meg/16Meg/32Meg	9/19/29/49
Dimension XPS Pro 150n, 180n, 200n (Edo pairs)	4Meg/6Meg/16Meg/32Meg	9/19/29/49
Dimension XPS D233, D266, D300 (SDRAM ECC)	16Meg/32Meg/64Meg/128Meg	49/69/129/239
Dptiplex GXA	32Meg/64Meg/128Meg	69/129/239
Dptiplex GL, GM, GMT (Edo pairs)	4Meg/8Meg/16Meg/32Meg	9/19/29/49
Dptiplex GS, GXL, GXM, GXMT (Edo pairs)	4Meg/8Meg/16Meg/32Meg	9/19/29/49
Dptiplex GXi, GXpro, 8180, 8200 (Edo, Ecc)	16Meg/32Meg/64Meg/128Meg	49/69/129/239
PowerEdge 2100, 4100 (Edo, Ecc)	16Meg/32Meg/64Meg/128Meg/256Meg	59/99/184/399/599

GATEWAY MEMORY

Desl. Big Screen D5 – SDRAM	16Meg/32Meg/64Meg	29/49/99
Dest Big Screen D6 – EDD (pairs)	4Meg/8Meg/16Meg/32Meg	9/19/29/49
Family PC w/MMX – SDRAM	16Meg/32Meg/64Meg	29/49/99
G5-166, 200 Prof System – SDRAM	16Meg/32Meg/64Meg	29/49/99
G5-166M, 200M MMedia System – SDRAM	16Meg/32Meg/64Meg	29/49/99
G6-200 Prof System – SDRAM	16Meg/32Meg	29/49
G6-Prof. M MMedia System – EDD	4Meg/8Meg/16Meg/32Meg	9/19/29/49
Multimedia G-5 Systems – SDRAM	16Meg/32Meg/64Meg	29/49/99
Prof, P-5 Series – SDRAM	16Meg/32Meg/64Meg	29/49/99

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CPU CHIPS

INTEL		Pro 200 256K/512K	249/450	Celeron 300/300A/333	99/189/219
Pentium II 450 MHZ	$750	Pentium 233 MMX	139	AMD	
Pentium II 400 MHZ	550	Pentium 200 MMX	129	K6-266	105
Pentium II 350 MHZ	379	Pentium 166/166MMX	79/129	K6-300	129
Pentium II 333 MHZ	289	Pentium 133/150	59/79	K6-2-300MHZ/350MHZ	139/259
Pentium II 300 MHZ	275	Pentium 90/100	49/59	K6-2-266MHZ/333MHZ	105/189
Pentium II 266 MHZ	229	486 DX4-100 / DX2-66	45/25	K6-200MHZ233 MHZ	89/105

IBM APTIVA, PC, P/S1 & P/S2

Aptiva 300, 500 Series	4Meg/8Meg/16Meg/32Meg	11/19/29/49
Aptiva 2136 (EDD, pairs)	4Meg/8Meg/16Meg/32Meg	11/19/29/49
Aptiva 2137, 2140, 2142 (SDRAM)	16Meg/32Meg/64Meg/128Meg	39/59/109/209
Aptiva A, M, 300, 500, 700 Series	4Meg/8Meg/16Meg/32Meg	11/19/29/49
Aptiva C, S, L Series (EDD, pairs)	4Meg/8Meg/16Meg/32Meg	11/19/29/49
PC 330 Models 6571-6576	4Meg/8Meg/16Meg/32Meg	11/19/29/49
PC 330 Model 6577 (EDD, pairs)	4Meg/8Meg/16Meg/32Meg	11/19/29/49
PC 350 Models 6581-6585	4Meg/8Meg/16Meg/32Meg	11/19/29/49
PC 350 Model 6586 (pairs)	4Meg/8Meg/16Meg/32Meg	11/19/29/49
PC 350 Model 6587 (EDD, pairs)	4Meg/8Meg/16Meg/32Meg	11/19/29/49
PC 730 Models 6875-6876 (pairs)	4Meg/8Meg/16Meg/32Meg	11/19/29/49
PC 739 Model 6877 (EDD, pairs)	4Meg/8Meg/16Meg/32Meg	11/19/29/49
PC 750 Models 6885-6886 (pairs)	4Meg/8Meg/16Meg/32Meg	11/19/29/49
PC 750 Model 6887 (EDD, pairs)	4Meg/8Meg/16Meg/32Meg	11/19/29/49
PC Server 310 (pairs)	4Meg/8Meg/18Meg/32Meg	11/19/29/49

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IBM NOTEBOOK/LAPTOP MEMORY

MODEL	AMT. UPGRADED	MEMORY PRICE	BATTERY NimH/Li-on
Thinkpad 310E, ED, 315	16Meg/32Meg	49/79	
Thinkpad 340, 345, 355, 360, C, CE	4Meg/8Meg/16Meg	49/59/79	119/—
Thinkpad 365C, CS, CD, E, ED	4Meg/16Meg	39/94	105/—
Thinkpad 365X, 365XD	8Meg/16Meg/32Meg/64Meg	29/44/89/179	105/—
Thinkpad 380, 380D, 385D	8Meg/16Meg/32Meg/64Meg	29/44/89/179	119/230
Thinkpad 500, 510CS	4Meg/8Meg/16Meg	49/59/89	160/109
Thinkpad 560, 560E, 560X, 380X, XD	0Meg/16Meg/32Meg/64Meg	29/44/89/159	241/—
Thinkpad 700, 720, 750, CL57SX	4Meg/8Meg/16Meg/32Meg	49/79/99/169	149/175
Thinkpad 701, 701C, 701CS	4Meg/8Meg/16Meg/32Meg	19/29/59/119	119/—
Thinkpad 755C,CE,CD,CS,COV,CSE,CV	4Meg/8Meg/16Meg/32Meg	49/69/99/169	140/271
Thinkpad 760C, CD, L, LD	8Meg/16Meg/32Meg	34/59/119	140/271
Thinkpad 760E, ED, EL, ELD	8Meg/16Meg/32Meg	34/44/89	140/271
Thinkpad 760XD, 760XL	8Meg/16Meg/32/64Meg	29/44/89/159	140/271
Thinkpad 765D, 765L	8Meg/16Meg/32Meg/64Meg	29/44/89/159	140/271
Thinkpad 600, 770 ED, 770 (SDRAM)	16Meg/32Meg/64/128Meg	44/89/149/389	

LASER PRINTER MEMORY UPGRADES

AMOUNT UPGRADED	256k	1	2	3	3.5	4	5	8	16	32
Brother 630, 631, 641, 645	–	39	59	–	–	–	–	–	–	–
Canon LBP 430	–	9	–	–	–	14	–	–	–	–
Canon LBP 860, 1260	–	–	9	–	–	14	–	29	44	69
Epson Action Laser 1100, 1600	–	14	19	–	–	14	–	29	49	–
Epson Action Laser II	–	59	–	89	–	–	119	–	–	–
Epson 8000, 1800, 4000, 4100, 4300	–	59	–	89	–	–	119	–	–	–
Epson 1000, 1500, 5000, 5200	–	–	30	–	–	60	–	–	–	–
HP 2, 2D–	–		33	–	–	79	–	–	–	–
HP 3, 30, 3P, 2P+	–	–	59	–	–	79	–	–	–	–
HP 4, 4M, 4Si, 4SiMX	–	–	9	–	–	19	–	39	–	–
HP 4L	–	29	–	–	–	–	–	–	–	–
HP 4MP, 4P	–	5	14	–	–	19	–	29	–	–
HP 4+, 4M+, 4V, 4MV	–	5	14	–	–	19	–	29	49	69
HP 5, 5M, 5MP, 5N, 5P, 5SI, 5MX	–	5	14	–	–	19	–	29	49	69
HP 5L, 6L	–	–	–	–	–	29	–	44	–	–
HP 6MP, 6P	–	9	19	–	–	19	–	39	49	69
HP Laser Jet 4000, 5000	–	–	–	–	–	21	–	49	90	149
HP Design Jet 200, 220	–	–	–	–	–	19	–	34	–	–
HP Design Jet 230, 250C	–	–	–	–	–	19	–	34	44	69
HP Design Jet 330, 350C	–	–	–	–	–	19	–	34	44	69
HP Design Jet 600, 650C	–	–	–	–	–	19	–	34	–	–
HP Design Jet 650C PS	–	–	–	–	–	19	–	34	44	69
HP Design Jet 700, 750C, Plus, 755	–	–	–	–	–	19	–	34	44	69
HP Deskjet 500, 500C, 510, 550, 560	29	–	–	–	–	–	–	–	–	–
HP Deskjet 1200C, 1200C/PS, 1600C, 1600CM	–	–	–	–	–	19	–	34	–	–
IBM Laser 4019, 4019E	–	–	–	–	109	–	–	–	–	–
IBM Laser 4029, 4037	–	–	–	–	–	49	–	–	–	–
IBM Laser 4039, 4079	–	–	39	–	–	49	–	99	–	–
Lexmark, Optra L, LX, R, RX	–	–	–	–	–	19	–	29	39	69
Lexmark Valuwriter 300, 600	–	29	39	–	–	49	–	–	–	–
Lexmark Winwriter 200, 400, 600	–	29	39	–	–	49	–	–	–	–
Lexmark S Series	–	–	–	–	–	–	–	19	39	69
NEC 95, 97	–	–	59	–	–	–	–	–	–	–
Oki 400E, 400EX, 410E, 410EX	–	67	89	169	–	169	–	–	–	–
Oki 010E, EX, 600E, EX, 610E, EX	–	29	79	–	–	119	–	149	229	–
Panasonic 4420/4450i	–	–	79	–	–	99	–	–	–	–
Panasonic 4410/4430	–	–	59	–	–	99	–	–	–	–
Panasonic 4450	–	89	–	–	–	–	–	–	–	–
Panasonic 4400/5400	–	49	89	–	–	99	–	–	–	–
Panasonic 4440, 5410	–	69	–	–	–	99	–	–	–	–
Panasonic 6500	–	14	14	–	–	49	–	–	–	–
Sharp 9400, 9460, 9600, 9700E	–	49	69	–	–	119	–	–	–	–
Sharp 9500, E, H, 9700, H	–	49	–	–	–	236	–	–	–	–

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COMPAQ MEMORY MODULES

Deskpro 450, 4100, 575, 590, 5100, 5133	4Meg/8Meg/16Meg/32Meg	11/19/34/59
Deskpro 575, 5120, 5133, 5150, 5160 (EDD, pairs)	4Meg/8Meg/16Meg/32Meg	11/19/34/59
Deskpro 2000, 4000, 6000 Series (EDO, pairs)	4Meg/8Meg/16Meg/32Meg	11/19/34/59
Deskpro 2000, 4000, MMX	16Meg/32Meg/84Meg/128Meg	29/49/99/199
Deskpro 6000	18Meg/32Meg/64Meg/128Meg	34/59/109/229
Deskpro 5/60M, 5/66M, XE560 (quads)	4Meg/8Meg/16Meg/32Meg	14/24/39/69
Deskpro XL 6150, 6200 (ECC, pairs)	8Meg/16Meg/32Meg/84Meg/128Meg	Call
Presario 510, 520, 524, 660, 720, 724, 860	4Meg/8Meg/16Meg/32Meg	11/19/34/59
Presario 920, 924, 954, 974, 970, 992	4Meg/8Meg/16Meg/32Meg	11/19/34/59
Presario 2100, 2120, 2200, 3020, 3060 (EDD pairs)	4Meg/6Meg/16Meg/32Meg	11/19/34/59
Presario 4112, 4122, 4160, 4402 (EDO pairs)	4Meg/8Meg/16Meg/32Meg	11/19/34/59
Presario 4504, 4508, 4528 (SDRAM)	16Meg/32Meg	34/69
Presario 4704, 4706, 4710, 4712, 4714, 4716 (EDO pairs)	4Meg/8Meg/16Meg/32Meg	11/19/34/59
Presario 4764, 4770, 4784, 4786 (SDRAM)	16Meg/32Meg	34/69
Presario 4808, 4814 (SDRAM)	16Meg/32Meg	34/69
Presario 7170, 7180, 9536, 9546, 9548, 9564 (pairs)	4Meg/8Meg/16Meg/32Meg	11/19/34/59
Presario 9232, 9234, 9240, 9250, 9642, 9660 (pairs)	4Meg/8Meg/16Meg/32Meg	11/19/34/59
Proliant 1000 5/60, 2000, R, 4000, R (quads)	4Meg/8Meg/16Meg/32Meg	14/24/39/69
Proliant 1500, 1500R (pairs)	4Meg/8Meg/16Meg/32Meg	14/24/39/69
Proliant 4500, 4500R (quads)	4Meg/8Meg/16Meg/32Meg/64Meg	9/29/44/69/129
Proliant 5000, 5000R (pairs)	32Meg/64Meg/128Meg/256Meg	Call
Prolinea 575, 590, 5100, 5120, 5133 (pairs)	4Meg/8Meg/16Meg/32Meg	11/19/34/59
Prolinea 5109, 5120, 5133, 5150, 5166 (EDD pairs)	4Meg/8Meg/16Meg/32Meg	11/19/34/59
Prolinea 575E, 100E, 120E, 575MX (pairs)	4Meg/8Meg/16Meg/32Meg	11/19/34/59
Prolinea 590MX, 5120MX (pairs)	4Meg/8Meg/16Meg/32Meg	11/19/34/59
Prolinea 6150E, 6180E (pairs)	8Meg/16Meg/32Meg	34/49/79
Prosignia 300 5/75, 5/90, 5/120, 5/150 (pairs)	4Meg/8Meg/16Meg/32Meg	14/24/39/69
Prosignia 500 5/90, 5/120, 5/150 (pairs)	4Meg/8Meg/16Meg/32Meg	14/24/39/69

COMPAQ NOTEBOOK/LAPTOP MEMORY

MODEL	AMT. UPGRADED	MEMORY PRICE	BATTERY NimH/Li-on
Armada 1100, 1120T, 1120, 1125	0Meg/16Meg/32Meg/64Meg	29/49/89/179	104/—
Armada 1130, 1130T	8Meg/18Meg/32Meg/64Meg	29/49/89/179	104/—
Armada 1510DM, 1520DM, 1550DMT	16Meg/32Meg/64Meg	49/79/159	139/229
Armada 1700, 7800	16Meg/32Meg/64Meg/128Meg	49/89/169/299	
Armada 4100, 4110, 0, 4120, T, 4130T (pairs)	8Meg/16Meg/32/64Meg	34/65/89/189 ea	—/219
Armada 7710MT, 7730MT, 7750DMT	16Meg/32Meg/64Meg	49/89/159	—/229
Concerto 4/25, 433	4Meg/8Meg/18Meg	9/59/79	105/—
Contura 4/25, 4/25C, 4/25CX	4Meg/8Meg/16Meg	39/59/79	119/—
Contura 400C, 400CX, 410C, 410CX	4Meg/8Meg/16Meg/24Meg	39/59/79/99	104/—
Contura 420C, 420CX, 430C, 430CX	4Meg/8Meg/16Meg/24Meg	39/59/69/99	104/—
Contura Aero	4Meg/8Meg/16Meg	39/49/89	194/—
LTE 5000, 5100, 5200, 5300	0Meg/16Meg/32Meg/64Meg Kit	69/99/199	138/259
LTE Elite 440C, CX, 4/75CX	4Meg/8Meg/16Meg/24Meg	39/54/69/99	130/—
LTE Lite 425	4Meg/8Meg/16Meg	49/59/79	147/—
Presario 1000, 1010, 1020, 1030, 1070, 1000	8Meg/16Meg/32Meg	29/49/89	110/217
Presario 1207, 1210, 1610, 1615, 1620, 1680	16Meg/32Meg/64Meg	44/89/139	112/230
Presario 1230, 1232, 1625, 1640, 1650, 1655	16Meg/32Meg/64Meg	44/89/139	

TOSHIBA LAPTOP MEMORY

MODEL	AMT. UPGRADED	MEMORY PRICE	BATTERY NimH/Li-on
Libretto 50CT, 70CT	8Meg/16Meg	39/69	—/161
Tecra 500CDT, CS, 510CDS, CDT	8Meg/16Meg/32Meg/48Meg/128Meg	29/49/89/129/269	231/239
Tecra 520CDT, 530CDT	8Meg/16Meg/32Meg/48Meg/128Meg	29/49/89/129/269	259—
Tecra 700CS, 700CT (SDRAM)	8Meg/16Meg/32Meg	59/89/149	279/259
Tecra 710CDT, 720CDT, 730CDT	8Meg/16Meg/32Meg/64Meg/128Meg	39/59/89/149/299	279/259
Tecra 750CDT, CDM, DVD, 780 CMD	8Meg/16Meg/32Meg/64Meg	39/59/89/179/159	
Tecra 730XCDT, 740CDT	8Meg/16Meg/32Meg/64Meg/128Meg	49/69/119/189/359	279/259
T1900, T4500, T4600, T4700, T4900 All Models	4Meg/8Meg/16Meg/32Meg	39/49/69/119	104/—
Satellite T100CS, 105CS, 110CS, 110CT, 115CS	8Meg/16Meg/32Meg	39/59/89	104/—
Satellite 200CDS, 205CDS Series	8Meg/16Meg/32Meg	39/59/89	104/—
Satellite 220CDS, 225, 300, 315, 325	16Meg/32Meg/48Meg/64Meg/128Meg	49/79/129/159/289	190/200
Satellite 2505	16Meg/32Meg/64Meg	49/89/169	
Satellite 4005 CDS/CDT	32Meg/64Meg/128Meg	99/149/369	
Satellite 320 CTS, 325, 330, 335	16Meg/32Meg/64Meg/120Meg	49/89/169/369	
Satellite T400 Series, T600 Series	8Meg/16Meg/32Meg	39/59/89	190/200
Satellite Pro 440, 445, 460	8Meg/16Meg/32Meg/48Meg/128Meg	29/49/79/129/159/289	190/200
Satellite Pro 490 XCDT, 490 CDT	16Meg/32Meg/64Meg/128Meg	49/89/169/299	
Portege 810CT, 620CT	8Meg/16Meg/32Meg	39/59/89	
Portege 650CT, 660CT	8Meg/16Meg/32Meg/64Meg/128Meg	29/49/79/159/289	—/210

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Compact Flash Adapter	15	Smart Medial Adapter 65

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MODEL	AMT. UPGRADED	MEMORY PRICE	BATTERY NimH/Li-on
ACERNote 763, 765, 782, 784, 786	4Meg/8Meg/16Meg	19/29/49	
ACERNote Light 356, 358, 359, 361 (pairs) edo	4Meg/8Meg/16Meg	19/29/64 ea	147/—
ACERNote Nuovo 971, 972, 372, 373, 374	8Meg/18Meg/32Meg	29/49/79	
ACERNote Pro 950, 954, 955, 957, 959 (pairs)	4Meg/8Meg/16Meg	19/29/64 ea	
AST Ascentia A Series and M Series	8Meg/16Meg/32Meg/64Meg	29/49/78/139	154/219
AST Ascentia P30, P50	8Meg/16Meg/32Meg	49/69/109	—/299
AST Ascentia J10, J30, J50 (pairs)	4Meg/8Meg/16Meg/20Meg	19/29/69/89 ea	—/166
AST Ascentia 800N, 810N, 900N, 910N	4Meg/8Meg/16Meg	46/58/79	105, 147/167
AST Ascentia 950N	8Meg/16Meg	59/79	—/167
AST Ascentia M5230 J/M 5260X	16Meg/32Meg/64Meg	49/89/169	
AT&T Globalyst 130	4Meg/8Meg/16Meg	19/29/59	103/—
Austin DX4, DX2, SX2, SX Series	4Meg/16Meg	69/169	126/—
Canon Innova Book 350CD, 360, 475 (pairs)	8Meg/16Meg	29/59 ea	119/—
Canon Innova Book 480, 490 EDD (pairs)	8Meg/16Meg	29/59 ea	119/—
CTX EZ Book 500, 600 Series	4Meg/8Meg/16Meg	19/29/59	138/—
CTX EZ Book 700 Pent, Series (EDD) (pairs)	4Meg/8Meg/16Meg/32Meg	19/29/69/109 ea	136/—
CTX EZ Book 760MT, 765MT (EDD) (pairs)	8Meg/16Meg/32Meg	29/69/119 ea	138/—
DEC HiNote Ultra, Ultra II	4Meg/8Meg/16Meg/32Meg	19/29/69/99	—/239
DEC HiNote Ultra 2000	16Meg/32Meg/64Meg	49/79/149	
DEC HiNote VP 520, 525, 535, 545/150MMX (pairs)	4Meg/8Meg/16Meg	19/29/59 ea	119/259
DEC HiNote VP 5100, 5120	8Meg/16Meg/32Meg/64Meg	29/49/79/169	119/—
DEC HiNote VP, CSS, LSS, CTS, LTS	8Meg/16Meg/32Meg/64Meg	29/49/79/169	119/—
DEC HiNote VP700, 703	16Meg/32Meg/64Meg	49/79/149	
Dell inspiron 3000	16Meg/32Meg/64Meg	49/79/139	—/229
Dell Latitude CP & CPI Series	16Meg/32Meg/64Meg	49/89/169	
Dell Latitude LM, LM P166MMX (pairs)	4Meg/8Meg/16Meg/32Meg	19/29/59/99 ea	—/245
Dell Latitude 433, C, CX	4Meg/16Meg	49/79	119/—
Dell Latitude LX, M	4Meg/8Meg/16Meg	49/59/89	105/—
Dell Latitude XP, XPI, XPI CD M166ST (pairs)	4 Meg/8Meg/16Meg/32Meg	19/29/59/99 ea	
Epson ActionNote 650, 650c, 660c, 660cx	4Meg/8Meg/16Meg	9/59/89	119/—
Epson ActionNote 880, 866c, 890, 910	4Meg/8Meg/16Meg/20Meg	19/29/69/99	119/—
Epson ActionNote 4LC/25, 4LC/33, 4SLC/2-50, 4000	6Meg	69.00	70/—
Fujitsu Lifebook 400, 500, 600 Series	8Meg/16Meg/32Meg/64Meg	29/59/79/149	103/203
Fujitsu Lifebook 500, 600, 700, 900 Series	16Meg/32Meg/64Meg	49/79/139	103/203
Fujitsu Monte Carlo, Montego, Milan	8Meg/16Meg/32Meg/64Meg	29/49/79/149	—/203
Gateway 2000 Colorbook 4/33	4Meg/18Meg	89/179	112/—
Gateway 2000 Solo Series (pairs)	4Meg/8Meg/16Meg	19/29/69 ea	
Gateway Solo Series 2100, 2200 edo	0Meg/16Meg/32Meg	49/79/179	—/219
Gateway Solo 9000, 9100, 2300	16Meg/32Meg/64Meg	49/79/139	
Hitachi C-Series	8Meg/16Meg/32Meg	29/44/99	
Hitachi E-Series, MMX Series	8Meg/16Meg/32Meg	49/69/129	119/219
Hitachi M-Series	8Meg/16Meg/32Meg	49/69/129	104/—
Hitachi Visionbook Elite, Plus, Pro	8Meg/16Meg/32Meg/64Meg	29/49/79/149	154/217
HP Omnibook 800	8Meg/18Meg/32Meg/64Meg	49/79/129/169	—/145
HP Omnibook 4000C, CT, C	4Meg/8Meg/16Meg	49/54/79	126/—
HP Omnibook 5000CT, CTS, C, 5500CS	8Meg/16Meg/32Meg	54/79/129	126/—
Micron Go Book 233 Lite, 233, 266	16Meg/32Meg/64Meg	49/89/169	
Micron MilleniaTransport Pentium (pairs), MRX	8Meg/16Meg	29/59 ea	
Micron MilleniaTransport VLX P133 (pairs)	4Meg/8Meg/16Meg	19/29/59 ea	
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Sharp 9000, 9030, 9020, 9050, 9300CD, T ado	0Meg/16Meg/32Meg	49/69/109	299/252
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TI Extensa, 450, 450T, 455, 455T	4Meg/8Meg/16Meg	19/29/59	147/—
TI Extensa, 510, 515 (pairs) edo	4Meg/8Meg/18Meg	19/29/59 ea	147/—
TI Extensa, 550, 555, 560, 565, 570 (pairs)	4Meg/8Meg/16Meg	19/29/69 ea	161/—
TI Extensa, 600, 605, 650, 900, T, CDT edo	8Meg/16Meg/32Meg	29/59/79	147/—
Twinhead, Altima, Compudyne, 486SX, OX, Tandy 4860	4Meg/16Meg	49/79	135/—
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Winbook XP5	32Meg	139	112/217
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Zenith Z-Star EX, ES	4Meg/16Meg	19/29/69	09/—
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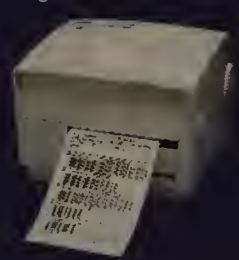

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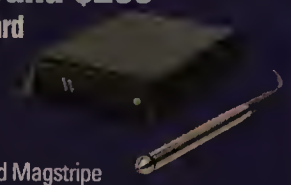

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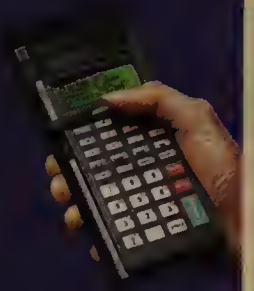

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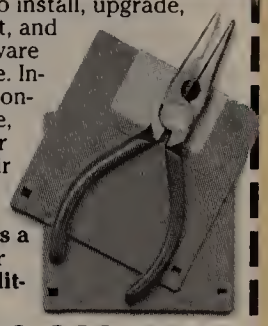

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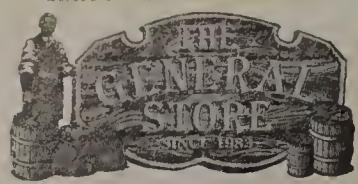

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952 Notebook computers
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955 Accounting software
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957 Network/sharing products
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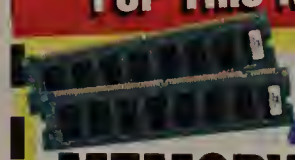

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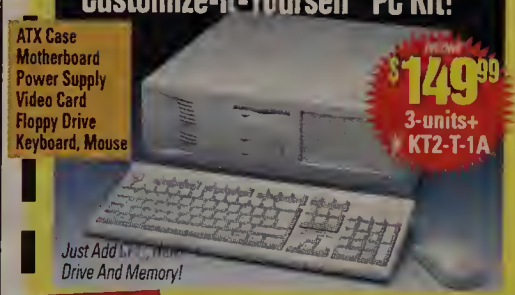

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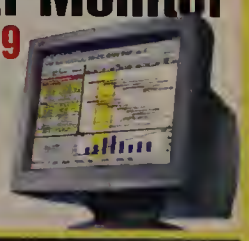

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WE ARE NOW IN THRALL to our computers. Bad enough that they make us work the way they want to rather than the way we want to. Now we've come to take that sorry state of affairs for granted. And things are only getting worse.

Take the act of shutting down your PC. It used to be easy: Finish your work, return to the DOS prompt, flip the switch, go home.

Now it can be an act of heroism. First, go to—of course!—the Start menu. Choose Shut Down. Pick an option. Wait while Windows churns. Answer a few questions about whether you want your dial-up connection to be disconnected or your unsent mail to be posted or your opened files to be saved or your DOS windows to be closed. Then, if you're lucky, the machine will turn itself off, or at least allow you to do it.

But more likely, something will screw up. My ancient Win 95 machine tends to get hopelessly confused if I don't turn off my Internet connection before issuing the Shut Down command. On Win 98 machines, the system often churns through the motions and then dies before it gets to the shut-off point. And when you reach for what looks like the power button, you discover it's actually a sleep button that interacts with the software in the machine. Since the software is dead, the button is useless.

Since when should **shutting down** and restarting **a PC** be almost **as complex** as running a **nuclear** power plant?

YOU CAN'T QUIT NOW

NOW YOU HAVE TO reach behind the unit and turn off the real power switch, or pull the plug, or, if you've read the online help only six levels deep at www.thisdumbmachine.com, do something like hold the button down for 15 seconds while whistling "La Marseillaise." The next time you boot up, a message will scold you for shutting down improperly. As punishment, you'll have to wait for ScanDisk to finish running—unless you're willing to risk offending the natural state of Windows.

Shutting down a notebook can be even more puzzling. Do you want to turn the machine off, suspend it, or hibernate it? Lately I've seen machines that display the message "It's now safe to turn off your computer" for an instant and then turn themselves off automatically.

And how does the computer turn back on? If you've put it to sleep, you can touch a button on the keyboard. But if you've shut it down, you have to locate the power switch. Since when should shutting down and restarting a personal computer be almost as complex as starting and shutting down a nuclear power plant?

SILLY WIZARD

THIS SORT OF THING drives new users absolutely nuts, but it's hardly the only example. My current favorite is the FAT32 converter that's included even on brand-new Win 98 machines whose hard drives are already formatted in FAT32. If you fiddle with the converter, you'd think the first thing it would tell you would be something like, "This drive is already formatted with FAT32." But no: A "wizard" pops up to tell you all about the benefits of FAT32 but neglects to mention that you've already got it—until you try to use the converter. That's when you're informed that the drive is "already FAT 32." A little late, Wiz.

I particularly dislike products that think they're smarter than I am. I wanted to see how a unit with a built-in DVD player performed with a standard TV set, but I don't have a TV in my office. When I tried to set up the machine for TV output so I could take it down to the living room, the video card refused, on the grounds that I didn't have a TV connected. So much for using it as a luggable DVD player.

Unfortunately, we take such headaches for granted. We expect things not to work right the first time or the second. We expect to ponder help screens trying to fix problems that shouldn't exist, only to find that answers aren't there. We dedicate our lives to work-arounds we've come to think of as normal. We think that's the way it has to be.

And as long as our computers are dominated by a monopoly that has no competitive incentive to do better, you know what? We're probably right.

PC World *Contributing Editor Stephen Manes has been writing about computers and their frustrations for more than 15 years. He is coauthor of* Gates, *a biography of Microsoft's chairman.* ■

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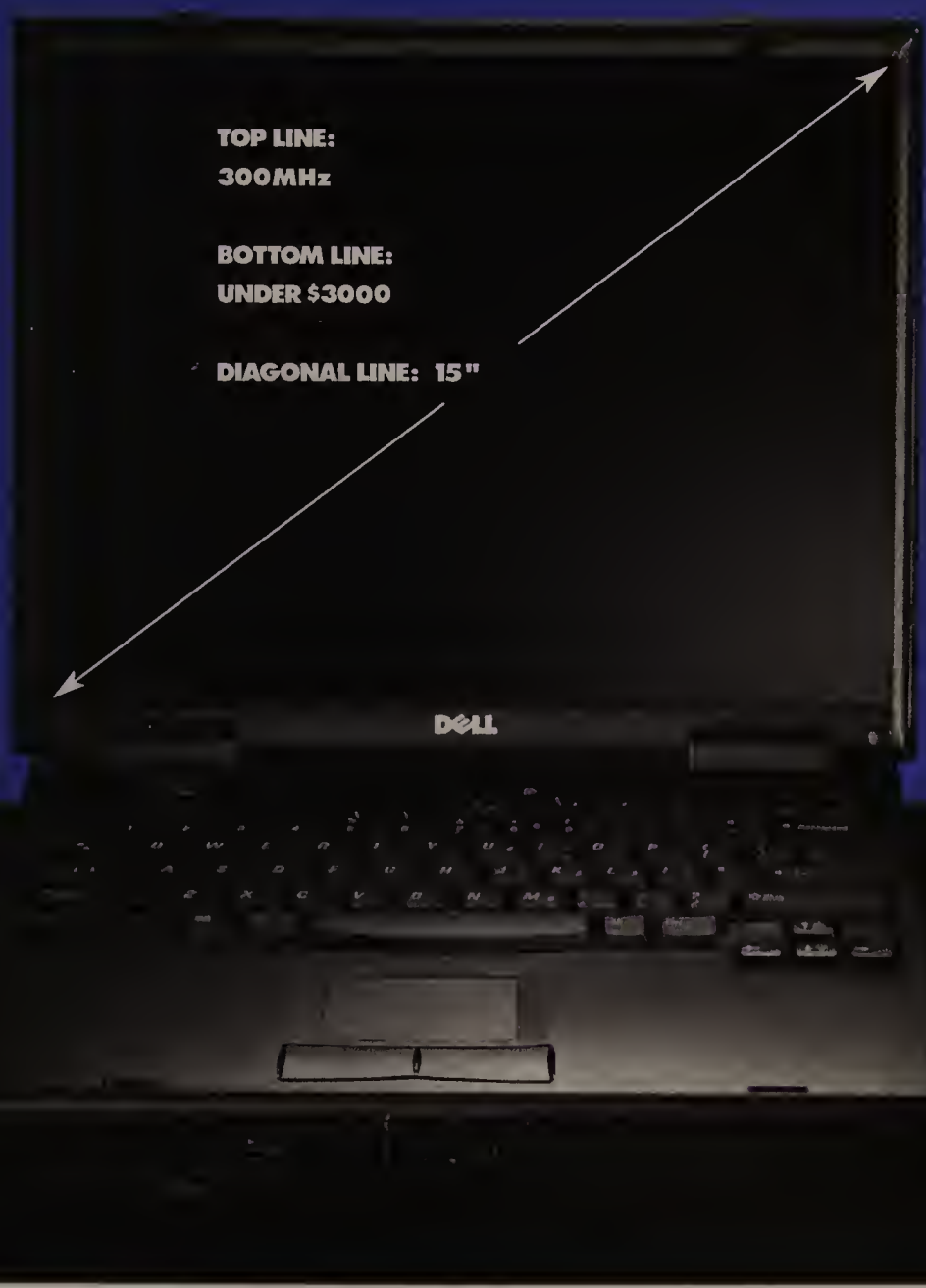

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